DYSENTERY

A

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by

Owen St John Moses. M.B., C.M. (Edin)
Fellow of the Royal Physical Society
Fellow of the Obstetrical Society
late Civil Surgeon, Backergunge, Bengal.

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Introduction.

Dysentery in relation to the diseases of India.

The reasons for choosing as the subject of this introduction the relative position which dysentery occupies among the diseases of India especially, are several. To commence with, since my graduation as an M.B. and C.M. of this University it has been my privilege to serve the Government in the Indian division of our vast empire in a capacity of some responsibility and one which has thrown me largely in the way of dealing with immense numbers of the particular disease in question. Secondly, though dysentery is a trouble by no means proper to India alone, yet it is one which finds such a happy hunting-ground amongst the millions that populate the country that I believe it would be a matter of considerable interest to try and determine the rank occupied by dysentery in the long list of diseases common in India drawn up in the order of their frequency of occurrence. Then again, as an additional reason for my choice of subject in this introductory chapter, I would add that in India and her indigenous drugs there appears to lie a clue

to advances which may possibly hereafter be made on scientific bases with regard to the treatment of this particular disease. And this appears to me the more important when I take into consideration that with regard to medicinal treatment at any rate our present knowledge of this troublesome ailment is still in a somewhat unsatisfactory condition.

At this stage then I may make the general assertion that in India and more especially in Bengal dysentery occupies amongst the more common diseases a place of very great prominence, so much so that the physician who is about to enter upon medical practice in that section of our empire cannot devote any attention which will be too great where the study of this very prevalent and often very serious malady is concerned. Nor can I at all exaggerate this prominence; on the other hand I fear that no matter what amount of literature I may be able to contribute upon the subject, I may still fall short of putting the truth in a sufficiently forcible form before the reader in order that he should realise to the fullest extent the importance to be attached to the study of the disease which is the subject of the present dissertation.

My past services with the Government have, I have said, thrown me in the way of observing and dealing with a very large number of cases of dysentery in its various forms and under a great many circumstances. As Civil Surgeon in charge of the districts of Noa-

khali and of Backergunge, as Superintendent of two large hospitals, four smaller or "subdivisional" ones and some five and thirty rural dispensaries, as Surgeon-Superintendent of five jails one of which accomodates no less than 500 to 600 prisoners, and as officer in charge of the sanitation of the two extensive districts of Bengal mentioned, I had my work laid out in the very hot-bed of dysentery. Being so placed I had great opportunities of observing and treating a large number of medical cases in a mixed population which represented very faithfully the different castes and sects inhabiting all the area from Calcutta on the West to the Tippera Hills on the East, and from the most northerly parts of Lower Bengal down to the sea. Moreover, being in charge of all matters connected with sanitation in the districts I kept myself informed of every outbreak of disease, of the birth-rate and death-rate of every police outpost and rural registering area, in short of whatever concerned the public health of the smallest sections of the districts, by means of daily, weekly and monthly reports and returns sent to me by responsible officers namely hospital assistants, police inspectors and registrars. In this manner anything that I was unable to observe for myself during my stay at headquarters or during my inspection-tours in particular parts within my "ilaka" (jurisdiction), was faithfully reported to me in official manner by three distinct sets of officials

the correctness of whose reports I was thus able to check by comparison with one another. The actual number of cases of disease which came under my direct observation and care under various circumstances, in the hospitals, in the jails, among natives of all classes, among Eurasians, Jews, Chinamen, Tippera hill-men, Mughs and Burmans (who form a large colony especially in the Chittagong division of East Bengal), and finally among the Europeans, was very large and typical of the various kinds of disease which existed over all this area. Thus I had ample occasion to observe the relative frequency with which the various diseases occurred. But extensive though this individual experience be, I would regard it as of no value unless it could be supported by the indisputable testimony of figures and corroborated by the experience of other observers upon the same subject. I therefore propose to support my statements by means of authentic figures and to compare with these such figures as from time to time I have collected during my own experience. It is not always possible to obtain the necessary material for making such observations with great accuracy, but where it can be done the corresponding figures will support one another and effect the point desired, namely to emphasise the importance I attach to a careful study of the disease commonly known as dysentery. This undoubtedly would be of immediate practical importance especially to those members of the medical profession

whose lot it is to practise in tropical and subtropical climes, yet it must of necessity be of unlimited interest to the large body of searchers after medical and scientific lore as well as a duty we owe to a section of humanity whose numbers in India alone comprise over 287 million souls.

As a second reason for limiting the subject of this introductory section to India I stated that that country affords a specially happy hunting-ground for the scourge of dysentery, a fact which will be far better realised when I reduce the statement to actual figures. But before doing so I will very briefly explain the manner in which these figures for the entire country are obtained. Roughly then, India is divided into provinces, and each province into districts. Now, each district returns its death-rate under the various headings of disease to the Sanitary Commissioner to the government of the province in which it is situated, and from the returns which are thus collected and summarised by the various Sanitary Commissioners for provinces the returns for the country as a whole are compiled. This method therefore gives only a moderately accurate set of results, considering the enormous masses of population concerned and the difficulty in many cases of securing correct information from rural areas far in the very interior of the country. Moreover, that such returns have a tendency to understate the prevalence of certain diseases in certain provinces

has been not only my experience but also that of many others who have had to do with them, and I am especially convinced of this tendency existing in the case of the returns showing the death-rate from dysentery in Lower Bengal. It is not surprising that there should exist this tendency towards inaccuracy, considering the inaccesibility of parts of the country at certain times of the year and the difficulty in the way of putting more effective methods into constant use. This difficulty I, for example, experienced to a great extent in the immense "water-district" of Backergunge, cut up as it is by the endless number of rivers, canals and watercourses and presenting a large area in the form of numerous islands in the Bay of Bengal, entirely inaccessible by means of the small country-boat (the only mode of conveyance available) for quite one-half of the year. Now, in official reports in India it is customary in dealing with the civil section of the population at any rate, to classify dysentery and the allied condition of diarrhoea together under the common heading "bowel complaints". The following are a few figures which might at this stage be quoted in support of my statement about India affording such an admirable field for the occurrence of these complaints.

In the period intervening between the years 1881-84 the average death-rate from dysentery and diarrhoea was 1.30 per 1000, or 1300 per million, as compared

with the English average of 652 per million for dysentery and diarrhoea, or the average mortality of 28 per million in England from dysentery. The mean death-rate for Calcutta from the same causes and during the same period (1881-84) was 3.14 per 1000. Statistics to show the death-rate from dysentery and diarrhoea which occurred in the entire Indo-European army were collected for the period intervening between the years 1870 and 1879, and it was found that the mortality from these causes alone was 1.60 per 1000. Corresponding figures for the native army covering the period 1867 to 1876 showed an average death-rate of 2.01 per 1000 from the same causes. Further, in jails in India generally, the death-rate from the same set of diseases from 1872 to 1881 averaged nothing less than 19.22 per 1000. One is very apt to be lost amongst figures, but a few such as I have quoted above will at present serve the purpose in view, that is will show sufficiently well that the disease forming the subject of these lines is responsible for a considerable proportion of deaths recorded among all classes of the population.

The third reason I gave for choosing India in particular in connection with these remarks upon the relative frequency with which dysentery occurs, was associated with treatment. In the course of my application of the science of medicine to the practical art I found that there remained much to be desired in the

way of a satisfactory method of managing cases of this disease. India afforded me the opportunity for observation, and I did observe, not only what we, physicians of the West could do to grapple successfully with the numerous cases of a disease which practising in India we would daily have to treat, but also what the men of the East did and had been wont to do for the many years during which dysentery had made a hot-bed for itself amongst those people. Moreover I compared the results according to their methods with those obtained from our modes. I found that although their knowledge of the theory was very deficient and based upon anything but scientific principles, yet they certainly had the most effective materials which they had empirically learned to apply and in no small proportion of cases with success. The observation of this fact tempted me in the beginning to give some of their methods a trial in a systematic manner, and I collected the results of no fewer than 420 cases ~~which~~ which from time to time were under my care for periods varying in length. But I must not anticipate. The observations I made in this connection, the results of the therapeutic test to which I submitted some of the methods of treatment which came under my notice, and what these methods consisted in, will transpire in proper order in the course of these pages.

Hitherto I have said something to show that dysentery in itself constitutes an important death-producing

agent but now comes the question, how does dysentery as a death-producing agent stand in relation to other diseases as factors concerned in the production of death ? To begin with then we must ask ourselves the question, which are the diseases that we might term common in such a vast country as India extending as it does roughly from 66°E. to 96°E. and from 8°N. to 36°N., and possessing the greatest variations in its physical configuration such as high mountains, elevated plateaux, low lying plains, marshy swamps, large rivers, and a multitude of other features which affect the conditions of rainfall and temperature in different manner in various localities ? Now inasmuch as the relation between the geography and climatology of a country on the one hand and the occurrence and nature of diseases on the other is most intimate, the questions which the preceding lines contain may be made the subject of an elaborate discourse by itself, but for the purpose I have in view it is not at all necessary to enter deeply into such considerations. The simplest manner in which I can arrive at a solution of the problem as to which the commonest diseases in India generally are, is by taking up the returns of the Sanitary Commissioners for the provinces and noticing the figures under the various headings of disease in the mortality tables for any particular period under report. There is no one who has thought of medical practice in connection with India, who has not at the same

time associated it in his mind with having constantly to do with malaria in its various manifestations, small-pox, cholera, dysentery and diarrhoea, and of recent years also with plague. It is this very set of diseases which is particularly reported upon in the sanitary reports for each district and province, with the single exception of plague which has attracted attention within recent years for one thing, which besides is not quite universal throughout the country, and for the observation and management of which very special arrangements have been made. It is the very set of diseases which the practitioner of long-standing Indian experience will testify as being made up of the most common conditions met with in medical practice of a mixed class. Besides these there are conditions that occur more or less frequently in various parts and under various circumstances, and for these provision is made in the reports for the districts of Bengal, at any rate, in a column headed "other diseases". Under this general name are comprised such troubles as diphtheria, measles, diseases of the respiratory organs and a host of others which though they do occur from time to time, account for only a trifling number of deaths as a general rule in comparison with such diseases as dysentery, cholera or malarial fevers.

A study of such general considerations as these then leaves no room for doubt regarding the importance of dysentery as a disease by itself. I have, moreover,

grouped together in a manner sufficient for my purpose some of the diseases which may be termed common in India, and my next concern is to compare these with one another with a view to determine the relative frequency with which the conditions prevail and contribute to the mortality of the country.

Now, in most matters of opinion, especially where the opinion is based upon the separate observations of individual observers, there is some degree of difference and this is so because all observers are not placed under exactly the same set of circumstances and do not look at the same subject always from one point of view. This I say, is the rule in most matters where opinions are based upon the independent work of individual observers, but the case of dysentery offers an exception to this rule. Thus Hirsch says " In India, as all observers agree and all statistics bear out, dysentery and diarrhoea hold the first place among the causes of death, producing a very high absolute mortality (especially in certain regions), or at all events a chronic cachexia which leads sooner or later to death in a direct or indirect way, and carries off an exceedingly large number of victims from among the European residents more particularly". But although there is such concurrence of opinion among authorities with regard to the position which dysentery as a disease occupies in the list of troubles common in India, yet in matters of detail there are slight differences of opinion

amongst writers, as I will from time to time point out. The observations and records of most observers are restricted very largely, for some writers deal with one section of the people and some with another, while some derive their experience more from the civil classes in India and others more from the military. But when the opinions arrived at by these various recorders ~~is~~ *are* summed up it is found that the aggregate affords a very faithful representation of the real state of affairs throughout all classes and in the country as a whole.

Writing on the subject of dysentery, Henderson says that bowel-complaint "is perhaps more fatal to natives than all other diseases put together", an opinion in which he is fully borne out by Tytler who ascribes as many as 75 per cent of the deaths among lower classes of natives to dysentery and diarrhoea. Hutchinson who has made a very careful study of the death-rates in connection with diseases, says that dysentery and diarrhoea are responsible for three-fourths of the deaths from all causes among the native military in the jail department of service. Thus it is seen that Henderson Tytler and Hutchinson, while agreeing with Hirsch with regard to the prominent position to be given to dysentery, lay more stress upon its occurrence among the native sections of the population, whereas the opinion of Hirsch associates the malady more closely with the European residents of the country.

Dr Graham Balfour, from official documents printed by order of the Madras Government, prepared a statistical report on the sickness and mortality among troops serving in the Madras Presidency. In his report he says "the extensive British possessions in India, comprehending within them such diversities of physical geography and varieties of climate, offer a wide field for the study of the natural history of disease and of the influence of climate on the different races of mankind, which has hitherto been little cultivated". The statistics which he has compiled are very complete and elaborate. On the basis of an examination of the relative proportions of admissions and deaths under each class of disease among the Europeans, he comes to the conclusion that fevers and diseases of the bowel furnish a third of the admissions, and that the latter and inflammation of the liver are the cause of half the deaths. Comparing fevers and bowel complaints, Balfour writes of fevers as being from their prevalence a source of considerable inefficiency, while he goes on to say that diseases of the bowels are more fatal among Europeans than fevers are and that they constitute the cause of upwards of two-fifths of the mortality. In continuation he says that "the great majority of the cases (of bowel complaints) are dysentery and diarrhoea and it will be observed that these have been proved more fatal at the stations on the table-lands,.... During five years 1834-1838 the ad-

mission at that station (Secunderabad) by dysentery alone amounted to 1591, and the deaths to 235, being in the ratio of 327 and 48·3 respectively per 1000 of mean strength". In his opinion dysentery and diarrhoea are not sources of such great sickness or mortality among the native troops, a circumstance which may in some measure be attributable to their habits of life. Such then are the views of an observer who has based his conclusions upon the experience of many years and has supported them by a series of statistics prepared from the authentic figures for a period extending from 1829 to 1841. But notice the slight discrepancy between this report and that made by Hutchinson regarding the frequency ~~of~~ and mortality of this set of diseases among the native military element. For while Graham Balfour's experience inclines him to regard dysentery and diarrhoea as less important causes in the "production of sickness and mortality among the native troops", Hutchinson puts down as many as three-fourths of the deaths from all causes among this section of the population to dysentery and diarrhoea. Such differences as these are due to the fact that the observations upon which the opinions are based, were made under slightly different circumstances; for on the one hand there can be no doubt from the authentic figures quoted by Balfour that dysentery is a very formidable disease among the European communities inhabiting the country, while on the other hand as reliable

figures can be produced to show that among the natives of both civil and military sections dysentery produces a very high rate of sickness and mortality. The fact is as Davidson puts it, that "the Presidency of Madras uniformly returns a high admission-rate, and usually a high death-rate from dysentery among the European troops, compared with those of the other Presidencies".

In this manner a great many other writers on the diseases of India may be quoted and their experience brought to bear upon the subject. Some may be of opinion that dysentery occurs more among one section of the population than another, and others that it is more prevalent in one locality than another, while still others believe that it takes place more at certain times of the year (the 3rd quarter) than at other seasons. Be this as it may, certain it is that all who have had experience in Indian diseases from the point of view of statistics, unanimously concur in placing dysentery with its allied condition of diarrhoea among those troubles which are foremost in India with regard to frequency of occurrence and severity of nature.

Thus, Parkes whose observations are based on European and Asiatic alike, and whose knowledge of the disease was derived both from the treatment of the living and from the examination of the dead, says that "dysentery is probably the most common disease in India and undoubtedly it is the most important, on account of its numerous alliances, and of the gravity of its conse-

quences". Again, Bampfield in his work dealing with the disease more particularly as it occurs in the East Indies, writes of dysentery as a "formidable and destructive disease", as the "scourge of our fleets and armies", and goes on to describe it as the acute disease of intertropical regions which alone has defied knowledge, baffled skill, eluded vigilance, mocked hopes and quickly precipitated patients to the grave or consigned them to chronic disease replete with suffering and danger. Evans writing from Tirhoot in India says that dysentery unless checked by the most decisive treatment at the commencement, "generally assumes a chronic character, whi~~le~~ch slowly, but too surely, conducts its victim to the grave". Burnard in an article dealing with the condition in Arracan, before he goes on to describe the severity of the ailment, says that "dysentery and diarrhoea were the diseases which proved most fatal, not in their acute form, but ensuing as a consequence of fever; and their ravages, particularly among the native troops were very great". Dr Brander whose experience of the disease was derived from Pooree, a very important district in Orissa, places dysentery first among the diseases which are most common in that part of the country. Thus he writes "as far however, as my intercourse with them (the natives) has afforded me opportunities of observation, I account the most prevailing diseases to be chronic dysentery, leprosy", etc. John Leslie, writing about the preval-

ence of the condition in Gowhattee, the capital of Lower Assam, and directing his remarks especially towards the occurrence of the trouble in connection with jails, classes bowel-complaints and fevers as the two most important among the prevailing diseases there, and he goes on to say that "fevers often usher in that intractable form of bowel-complaint (dysentery) from which so large a proportion of the mortality of this (the Gowhattee) jail originates". Dr Lownds, writing from Mount Aboo in the Bombay Presidency (24° 40 N. and 72° 56 E.), a place at an elevation of 4015 feet above sea-level, remarks upon the very prominent position which dysentery occupies, stating that in cases where the patients have had previous attacks to a considerable extent, the anxiety which the condition gives rise to must be great.

In this manner then I could go on and quote the experience and opinions of innumerable authorities upon the subject of this disease in India, and in every case the evidence would point in the same direction. The quotations I have made above are only a very few, but I think they will suffice to impress the reader with a sense of the accuracy of Hirsch's remark which I have cited in a previous page and in which he very well says how all observers and statistics are at one in giving to dysentery the foremost rank among the ordinary diseases of India. In the list which I have given I have endeavoured to select the opinions of observers repre-

senting various parts of the country from the far East to the very West, from places like Pooree on the sea-level in Orissa, like Gowhattee in hilly and malarious Assam, and like Arracan on the borders of remote Burmah to a place such as Aboo in the West and over 4000 feet above the level of the sea. From a consideration of the opinions from such varied sources, which if necessary could be further supplemented with the testimony of other well-known authorities on the diseases of India, as for example Fayrer, Chevers, Goodeve, I think we are justified in giving to dysentery a place of such very high prominence, being as it is accountable for so vast a proportion of the sickness and mortality among all classes of people resident in India.

On consulting my notes of a series of cases of a purely medical nature that came under my treatment at various times and under various circumstances, I find that a very large proportion indeed consisted of dysentery. The figures given in the following table represent the percentages of dysentery among all medical cases attended by me during various periods of time.

	General Medical Practice	Police Hospᵗˡ	Civil Hospᵗˡ (out & in)	Head-qrs Jail.
Calcutta (City)	20·5	x	x	x
Noakhali (District)	13	20·5	35·5	51
Backergunge (Distr.)	27	31	41	71

This gives an average of 20·5 for Calcutta, 30 for the district of Noakhali, and 42·5 for the district of Backergunge, as the number of cases of dysentery per cent of all medical cases treated respectively in the three places mentioned. I have included pilgrims but not emigrants in the above estimation, chiefly because the large bulk of emigrants passing through East Bengal were under the supervision of special officers appointed for the purpose. When I was in the Emigration Department of the medical service I very often had occasion to deal with cases of medical diseases among emigrants (the so-called "coolies") who were selected from all parts of Bengal, Behar, Nagpur, and even Assam, and housed in depôts in various parts of Bengal, especially in Calcutta. The longest period for which I had occasion to observe a batch of these emigrants over 400 strong, was 21 days. They were bound for Natal and during the period I had them under ~~my~~ medical supervision, I recorded no less than 209 cases of dysentery among their numbers within the three weeks. The cases were of a mild type and only a single death was recorded from this cause; in that case there was a history of previous attacks, there occurred much sloughing of the mucous membrane of the intestine, and the patient rapidly became moribund and died.

There yet remains that I should briefly compare some of the other conditions of frequent occurrence with dysentery. But when we take into consideration the very

first set of troubles which we have to do with in this way, namely the large group of diseases classed together under the general name of "fevers", we find that taken together they probably outnumber any other ailment of a medical nature concerned in the production of sickness or of death. But let us for a moment analyse what is meant by, and what conditions are included under the somewhat wide designation of fevers, at any rate so far as the term is used in Indian sanitary reports and returns. It includes a variety of conditions such as simple continued fevers, febriculae, remittent fevers, ague, and enteric fever. An idea of the relative proportions in which these individual varieties occur may be had by considering the observations made in the Madras Presidency with regard to 2952 admissions for fever in the period of years between 1871 and 1880. It was found that out of the total,

831 (or 28 %) were cases of simple continued fever,
491 (or 17 %) were cases of febricula,
177 (or 6 %) were cases of remittent fever,
1413 (or 48 %) were cases of ague,
40 (or 1 %) were cases of enteric fever.

Thus, when the reader keeps in mind the large variety of conditions included under this term "fevers" as used in the sanitary reports for India, he will not be greatly surprised to learn that the figures contributed to the mortality returns by this group are considerably larger than those under the heading of dysentery.

In this way in 1884 a death-rate of 16·70 per mille of the general population is said to have resulted from fevers, as compared with 1.30 per mille the death-rate recorded about the same period for dysentery for the entire population of India. But if instead of taking the large group of fevers as a whole, the different varieties were to be considered separately, it would be found that the figures contributed by any one variety, such as enteric, are small in comparison with those returned for dysentery. Thus from 1881 to 1884 while the number of deaths recorded from dysentery was at the rate of 1·30 per mille of entire population, the number put on record during the same period for enteric fever, and that among the class which the disease attacks most namely the military, was only 0·1 per mille on the average! Again, in the period extending from 1867 to 1876 fevers taken together accounted for 25·8 per cent of the total deaths in the native Bengal army and for 21·2 per cent of the deaths among the European troops in Bengal; or, as it was afterwards in 1884 computed, the death-rate from fevers in general in the entire army was 1.80 per 1000, and in the European army in India 3.38 per 1000, giving an average death-rate from fevers of 2.59 per 1000 for the whole Indo-European army. The corresponding figure showing the death-rate from dysentery in the native army for exactly the same period is 2·01 per mille. The first

point that strikes one when looking into these figures is that as far as the death-rate among the military section of the population is concerned, dysentery is quite as important a factor in producing it as the entire group of fevers together, an observation which has a direct bearing upon the subject, considering the large numbers involved in the military element in a country of the size of India. A second feature about these figures, which does not fail to attract attention, is that the civil population contributes a far larger proportion to the death-rate from fevers than does the military section. Apart from such reasons for this difference as that the troops are less exposed to the conditions which increase the fatality of fevers, and that they are made up of selected men better fed and clothed, there is the important fact that being always under discipline and direct observation, a more faithful record of the actual number of fever cases that occur among them can be kept.

This affords me an opportunity to remark <u>en passant</u> upon the very large figures which are constantly returned in connection with the fever mortality among the civil classes of the population in India. It is difficult for anyone without local experience to realise the extent of the laxity which exists in regard to the diagnosis and proper nomenclature of diseases in the case of a class of men employed to hold charge of rural dispensaries within the registering areas in the

interior of districts. A case is on record where the Civil Surgeon of the district of Chanda in the Central Provinces (vide Sanitary Commissioner for the Central Provinces' Report, 1884), enquired into the facts connected with 150 cases reported to him as having died of fever and he found that only 41 of these deaths could actually be ascribed to fever. In one instance, suspecting that too large a number of cases was being reported to me under the heading of deaths from fever, I made a point of personally visiting several villages in the Feni subdivision in the northern part of the district of Noakhali in company with the hospital assistants in charge of the drawing up of those reports. I found that out of 17 cases in one village, 55 in another, and 103 in two others, reported as having from time to time died of fever, in only 8, 23, and 60 cases respectively could I satisfy myself that some form of fever had been the actual cause of death. In the remaining cases some rise of temperature or febrile complication had, it seemed, occurred and this the medical attendant in his carelessness or ignorance had put down to be the cause of death. The great tendency then is for the class of men entrusted in the first instance with the collecting of these items of information, to report a variety of conditions as "jaur" or "bokhar" (fever) thereby swelling the death-rate from that cause at the expense of some other which sinks into corresponding insignificance. This source of error exists

chiefly in the case of the death-returns from fever, and it is of importance inasmuch as it affects the figures we are here concerned with, making fevers look unduly important as factors concerned in the production of death, in comparison with dysentery or with any other complaint for that matter.

Small-pox demands a brief consideration on our part in regard to the manner in which it stands comparison with the conditions we have hitherto been engaged in studying. Though an endemic disease in every province of India, small-pox accounts for less than 5 per cent of the total mortality of the country. This contrasts very favourably with the figures we have hitherto been considering in connection with fevers, namely 25·8, the percentage of the total deaths in the native Bengal army and 21·2, the percentage of the total deaths among the European troops in Bengal during the period extending from 1867 to 1876. The annual death-rate from small pox during exactly the same period was 0·20 per 1000 among the native troops, and 0·15 per 1000 among the European troops in Bengal, whereas on the other hand from dysentery and diarrhoea among the native troops alone from 1867 to 1876 the death-rate was 2·01 per 1000. These few figures will suffice to show how it is that small-pox bears no comparison with either fevers or dysentery as to the production of mortality. My experience in Bengal at least has extended over all parts of the province and all seasons of the year, and I am

inclined to regard endemic small-pox as an unimportant factor in the production of either sickness or mortality. Epidemics of this disease are rare, the last on record having occurred in the Central Provinces as far back as 1879; moreover when small-pox does occur in epidemic form it is usually limited to some one or other locality. This immunity which the country in general enjoys against small-pox is undoubtedly attributable to the efficient manner in which vaccination has been established and spread throughout the country. At the present time the institution is very generally accepted by the natives, with the exception of a class of Mahomedans known as "Ferazees". This sect is very apt to resist any attempt at vaccination and that in a very fanatical manner upon religious or caste prejudices, but in no case have I found this difficulty to persist in the face of tactful management. In one case it was reported to me that some 200 Ferazee Mahomedans in the jurisdiction of "thana" (police station) Chagulniya, in the district of Noakhali, totally resisted all attempts at vaccinating them. I proceeded on the next day to the locality with just one sub-inspector of vaccination, choosing for the occasion a Mahomedan named Nazimoodin Bhuyia. My first step was to send for the village-chiefs, "punchayets", and others of influence and to impress them with a sense of the risks they were incurring by rejecting so beneficial and harmless a thing as vaccination. I listened to all their object-

ions and finally obtained their unanimous consent to be vaccinated on my promising personally to supervise the operations and to ensure that no lymph would be taken from the arm of any Hindu for the purpose of vaccinating them. As most of the lymph used by me was either taken direct from the calf or consisted of lanoline vaccine paste prepared at the central vaccination depot in Calcutta and forwarded to me, I had no difficulty in satisfying their scruples. On the same day 112 children and 48 adults were vaccinated successfully. The following day allowed me to record a few more such operations, and when I left the locality I was satisfied that all spirit of opposition had been removed.

Cholera, unlike the previous condition, is a factor of considerable importance in the production of the death-rate of the country. From 1880 to 1884 the mortality from this disease was 1.59 per 1000. Again the death-rate from cholera during a period of several years ending 1876 was, for the native troops in Bengal 4.27 per 1000, and for the European troops in the same province 2.12 per 1000. If a comparison be made between these and the corresponding figures for dysentery, namely 2.01 per mille for the native army during the same period and 1.60 per mille for the Indo-European army during the period 1870 to 1879, it will be found that in the military element of the population at any rate cholera is even a little ahead of dysentery as a

producer of mortality.

This brief survey of the subject I have tried to illustrate by means of figures which I have thought typical and which cover a sufficiently wide area of observation. Such figures clearly show the prominent position held by dysentery not only as a disease by itself but also as one of a number of conditions which combine to make the average death-rate of India a comparatively high one. But though these figures bring out this fact with regard to India as a whole, yet they do nothing to show that in certain regions of that country dysentery by means of the numbers in which it occurs and produces death, far obscures every other condition of a like nature. This fact I never fully realised till I took over charge of the district of Backergunge with its large jails and medical institutions, notwithstanding that I had previously been in charge of Noakhali where dysentery is far from uncommon. And here I might take the opportunity of mentioning wherein lies the importance of these two particular localities. Backergunge is one of the largest, and from its situation, most important districts in the whole of Bengal, it has very aptly been termed the "granary of Bengal", and Barisal its capital, is a very large trading centre in the province; these belong to the Dacca division. Noakhali, in the Chittagong division, lies on the direct pilgrim route between Bengal and Assam on the one hand and Chittagong the port for the pil-

grims on the other, whenever the pilgrim traffic on the other routes is stopped for any such reason as plague, as was the case in 1898 for instance. These conditions necessarily mean large concourses of people especially during the trading seasons in the former case and the pilgrim seasons in the latter instance, a state of affairs which in its turn is intimately associated with outbreaks of diseases and their spread. Attention to the conditions affecting health and the nature of the diseases which prevail in such localities therefore becomes a matter of considerable importance. The scourge which dysentery constitutes I say I realised fully only when I took over charge of Backergunge with its numerous public institutions. And this brings me to consider for a moment the noteworthy fact that in the jails in India generally dysentery occurs with astounding frequency and often assumes a very severe type. Between 1872 and 1881 the mortality from this cause in Indian jails was on the average 19.22 per 1000 of jail population. During the year previous to my taking charge of the jail at Barisal the rate at which dysentery (not including diarrhoea) occurred among the jail population was 71 per 1000, and out of the total number of cases of dysentery alone which were treated in that year in that institution over 10 per cent died. In fact so high had been the mortality during that and previous years from the particular cause in question that on my arrival I was told by an official of high

standing that in this district it was not the incarceration and the hardships connected with it so much as the high death-rate from dysentery known to exist in that jail which constituted a deterrent to crime. Such being the case I was requested to make it my special business to look into the state of affairs with a view to remedy the existing evil.

Thus it was the special nature of my duties which gave me the opportunity of studying carefully cases of dysentery in what I may term its very home. I had some success in dealing with the condition and reducing the mortality as I was able to show in my reports to the Government, and it is my desire to put the nature of my observations and of the forms of treatment I adopted in the vast majority of cases, before my masters in the <u>alma mater</u> which has impelled me to choose the subject of this particular disease for a thesis.

Chapter I.

THE HISTORY OF DYSENTERY.

There is no period in the history of medicine in which the existence of dysentery as a distinct disease and one of great importance was not recognised. The earliest literature which can be traced upon the subject dates as far back as the time of Hippocrates who lived a little more than four centuries before Christ, and in the works of that ancient writer, included in what is termed the "Hippocratic collection", are to be found evidences that the ancients not only knew of the disease but also described it fairly accurately under the name of δυσεντερια, which term is obviously derived from δυς, ill, and εντερον, intestine. And not only so, not only did Hippocrates know and write about dysentery, but he also handed down evidence that he associated the condition of diarrhoea with the more severe inflammatory affection of the intestine and that he realised the intimate manner in which the two are allied to one another in epidemics. The next re-

liable information which we have regarding the subject of this disease as known to the ancients, is that furnished in the writings of Celsus, a Roman physician who lived during the reigns of the Emperors Augustus and Tiberius, that is about the time when Christ was born. The great work of Celsus was the "De Medicina" written in eight volumes of which the third and fourth comprised the subject of the diseases of the internal organs. In the fourth book of his great work Celsus describes the disease under the name of "tormina", a term commonly used among the Romans and preserved even in modern times by physicians to imply those transitory pains in the bowels of a twisting or wringing character which are frequently met with in severe cases of dysentery. Next we have a record of the disease as handed down to us in the second of the eight volumes on diseases in general as written by Aretaeus (Ἀρεταῖος), a Cappadocian and an eminent physician who flourished during the reign of Vespasian (A.D.70 to 79). In this work as published by Kuhn is mentioned the evacuation of long pieces of membrane like the intestinal tube, which the ancient physician took for detached portions of the intestinal coat itself. The chain of historical evidence next brings us to the times of the Emperor Trajan during whose reign extending from 98 to 117 A.D. there practised in Rome a celebrated Greek physician named Archigenes only a few fragments of whose works remain. Aetius, however, a Greek medical writer of the

end of the fifth or beginning of the sixth century, made a compilation in sixteen volumes from many authors whose works have since been lost, and in it reference is made to the knowledge which Archigenes possessed of dysentery as well as to the excellent description which he gave of that disease. Next follows the evidence of Claudius Galen, commonly known as Galen, a very celebrated physician who lived from 130 to 200 A.D. In the course of his commentaries on the works of Hippocrates as well as in his original works, Galen refers to dysentery and does not fail to describe the tubular casts of the intestines which were noticed by Aretaeus, the physician of the preceding century. Caelius Aurelianus a famous Latin physician who lived in the fourth century after Christ, wrote five books entitled "On chronic diseases"(De Morbis Chronicis), and in the fourth of these he describes dysentery.

In this manner then we find not only that dysentery existed as a condition of common occurrence in the times of the ancient Greeks and Romans, but also that the physicians of old were familiar with the more prominent signs and symptoms which characterise the disease in most of its forms. But the works of medical writers of ancient times are not the only source from which our information is derived regarding the occurrence of the disease in the early ages. On consulting the history of the Peloponnesian War which opens the

2nd book of Thucydides, a very graphic description is found of the plague of Athens which raged in the year 430 B.C., or as it is sometimes called the Plague of Thucydides since that Athenian historian was affected by the condition and was one of the few who recovered. In describing the symptoms of the disease in the 7th chapter of his second book Thucydides says,"this I can the better do,as I had the disease myself and watched its operation in the case of others". The opinion that a severe form of bowel-complaint of the nature of dysentery played an important part in that outbreak is warranted by the description contained in such passages as the following, "When it (the disease) fixed in the stomach, it upset it and discharges of bile of every kind named by physicians ensued, accompanied by very great depression", and again, "but if they (the victims) passed this stage, and the disease descended further into the bowels, inducing a violent ulceration there accompanied by severe diarrhoea, this brought on a weakness which was generally fatal".

Tracing our way down from the most ancient days of authentic literature to the mediaeval ages, we find numerous references to, and descriptions of the disease in the works of authors, medical and otherwise, both of the East and of the West. Thus in the East Arabian writers of the middle ages testify in their works to the prevalence and importance of dysentery as a disease of their times. In the West authentic

historians have recorded their testimony with regard to the condition, chiefly in connection with the great war-epidemics of dysentery which broke out from time to time in the countries of Europe. Of the Oriental writers I have referred to, Avicenna the Arabian physician who lived from 980 to 1037 A.D. may be quoted as an example. In his works which have been very ably rendered into mediaeval Latin, there occurs a passage which not only shows distinctly that dysentery was well known as an important disease, but which also intimately associates seasonal conditions with the occurrence of the ailment. Thus he writes,"Si hyemem austrinam ver sequitur aquilonium, et hoc deinde excipit aestas fervida valde ventisque vacans: multaeque si caelo sunt demissae pluviae, et ver materias usque in aestatem continuit; multi per autumnum in florida sua aetate morte conficientur, frequens incidit dysenteria, intestinorum ulcera, et tertianae nothae diuturnae". Bhagvat Sinh tells us that the "treatment of diseases caused by humours forms part of Chikitsa or the therapeutic branch of Hindoo medical science", and that the Aryans treated and prescribed remedies for different diseases among which are included dysentery of five kinds. Of the Western writers of the middle ages who have handed down their testimony on the subject of this disease I will mention a few when I come to consider the great epidemics of dysentery of historical importance.

Next, passing from ancient and mediaeval history and coming to modern times, we find that innumerable contributions have during the past four centuries been made to the literature on the subject of this disease. Therefore writing at the present time and taking into account the facts brought out in a historical review of this nature, one might without the least hesitation say that from the remotest ages accessible to historical enquiry, from as far back as the times of Hippocrates before which we have no reliable information on this matter, down to the present day dysentery has always been regarded not only as a distinct but also as a serious condition affecting the health of mankind.

But history not only affords invaluable evidence that dysentery has been known to prevail at all times and in all parts of the world as a condition distinct in itself, as an endemic disease; it also informs us how the trouble has from time to time and in many countries occurred in epidemic form. Thus I have already alluded to a reliable historical account of such an outbreak of this disease which took place as far back as the year 430 B.C. during the Peloponnesian War. In the historical records of somewhat later days we find more frequent reference made to the trouble in its epidemic form, especially in the descriptions of the war-pestilences of those times. Thus Gregory, the historian of the Franks, who lived in the sixth century, and Paulus Diaconus the historian of the Lombards, who liv-

ed in the eighth century, have left very faithful accounts of the epidemic manner in which dysentery raged in France in the years 534 and 538. Saxo Grammaticus, the Danish historian, who lived in the twelfth century, has recorded an epidemic of dysentery which in the year 760 extended over the north-east of Europe to a large extent. Similarly we have accounts of the war-dysentery among the German troops in Hungary in 820, of the pestilence in Germany in the years 1083 and 1113, of the outbreak in England in 1316, of the outbreak in 1330 along the Ligurian coast, and of the disease as it occurred in Bordeaux in 1411.

When, however, we come down as before to modern times we find endless accounts of endless epidemics of this disease recorded within the period of the last four centuries. It would be of little avail were I, in the limited space I have, to enumerate one after another the epidemic outbreaks of dysentery, the accounts of which have filled the pages of chroniclers between the beginning of the sixteenth and the end of the nineteenth century. It is sufficient that I should just mention a few of the more formidable outbreaks which occurred over large and important tracts of country. There is no country in Europe where dysentery has not at some time or other, and in many cases repeatedly, made its ravages on a wide-spread scale. Thus in Great Britain the period between the years 1668 and 1672 bore witness to a great epidemic of the disease, while in

Ireland similar occurrences took place in 1728-1730, 1817-1818, 1824-1826, and in 1846-1848. In France several epidemics of dysentery were recorded in connection with the years 1749-1750 and again in 1859. In Germany no less than six such outbreaks took place between the years 1583 and 1852. Similarly from Switzerland, Holland, Belgium, Norway, Sweden, Italy, in short from every country of the Continent we have accounts of numerous and extensive epidemics of this kind. In the United States of America three large outbreaks occurred in the latter half of the eighteenth century alone. Similarly evidence is available that in all parts of the inhabited world visitations of epidemic dysentery have occurred with greater or less frequency and severity.

In the foregoing remarks I have not taken into account the records we have of what are known as pandemics of dysentery in which form the disease has scourged Europe by no means infrequently. The first report we have of such a wide-spread outbreak of this trouble extending over a vast portion of the continent of Europe dates from 1538, and this instance has been recorded by several historians. Since that time many such pandemics have occurred and have been recorded on the same continent. Thus two were reported during the eighteenth century corresponding to the year 1719 and to the period 1779-1783, while five occurred during the present century corresponding to the periods 1811, 1834-1836,

1845-1848, 1853-1855, and 1882, the last being confined chiefly to Sweden. In America a similar outbreak is reported as having begun in 1847, reached its height in 1851, and continued with greater or less severity up to the year 1853.

There still remains one point to consider in this connection in order to complete this brief historical account of dysentery, namely the occurrence of the disease in relation to war. The references made to the Peloponnesian War serve to illustrate the occurrence of this phenomenon in ancient times, while numerous allusions have already been made to similar occurrences in relation to the wars of the middle ages in Europe. But the relation between war and its effects on the one hand and the occurrence of dysentery on the other, has been studied more particularly by means of the observations made during the great military campaigns of the present century. So constant and marked has been the connection between the two conditions at present being considered, that Hirsch says "there has been hardly a single war of long duration, hardly a single siege protracted over several months, in which dysentery and diarrhoea have not broken out in the hostile armies in the field, or among besiegers and besieged. Among war-pestilences, alongside of typhus and typhoid, these diseases have always taken a foremost place". The wars of Napoleon which lasted up to 1815,

the Crimean War of 1854-1855, the Franco-German War of 1870-1871, the Russo-Turkish War of 1878-1879 are all instances in the Eastern hemisphere, just as the Secession War in the United States is an example in the West, where dysentery prevailed to a large extent and added to the horrors of warfare.

Such then is a short account of the history of the malady we are engaged in considering, and in conclusion it may be mentioned that as far as Europe is concerned, dysentery has of late years lost its importance as an endemic disease, whereas epidemics of it on that continent are of far less frequent occurrence now than they used to be in more remote periods.

Chapter II.

GEOGRAPHICAL DISTRIBUTION.

Everything that it is possible to write on the subject of the geographical distribution of this disease, may be summed up in that pithy statement of Ayres, "Of dysentery it may be said that where man is found, there will some of its forms appear". In respect therefore of the wide area of distribution which this malady enjoys, it is scarcely comparable to any other disease. While to some extent dysentery resembles the diseases comprised under the term malarial, in the manner of its endemic prevalence, in the frequency with which it occurs epidemically and in the way in which it varies in the severity of its type, yet it differs from those diseases inasmuch as it occurs in epidemic form in regions that are quite free from malaria, that is in the higher latitudes of the colder zones. Putting it generally, dysentery may be said to occur like the malarial diseases, with greatest intensity, and as an endemic with the greatest severity, in the equatorial re-

gions; whereas in subtropical climes both as an endemic and as an epidemic it occurs with less intensity and less frequency; while in still higher latitudes it scarcely occurs in endemic form though as an epidemic it prevails every now and again over areas of varying extent. This is a general outline of the manner in which the disease is distributed and the truths contained in this will be better realised when we proceed with the study of the subject in connection with the large areas of which the inhabited world is comprised.

Asia. If we commence with Asia as being the continent which includes the favourite haunts of dysentery, we notice at once an instance of the manner in which the foregoing remarks are verified. For it is the mainland of southern Asia and the neighbouring archipelagoes, that is the latitudes nearest the equator, where the disease flourishes most abundantly; thus India, especially Lower India, Ceylon, the Malay Archipelago, the southern coasts of Persia and of Arabia, and the south-eastern coast of China are the localities of Asia where the occurrence of dysentery is most marked both with regard to frequency and to severity of type. In fact it is universally admitted that these are the foremost among the places in the world where this ailment prevails. Evidence has already been recorded with regard to the severity of the condition as it occurs in India, and in this connection it only remains that I should draw attention to the fact that in India also

the same law holds good, namely that dysentery like malaria occurs more frequently and formidably in the southern or lower than in the northern parts of the country. Thus for example the rate of admission and the mortality due to this cause though high in the Punjab, are small in comparison with the corresponding rates that prevail in Bengal, Madras, Bombay, Assam and the Central Provinces. On the other hand when we go further north into Beluchistan and Afghanistan we find that although these countries are the seat of an endemic form of dysentery which often proves fatal, yet they show to a greater extent the prevalence of what is known as "hill diarrhoea", a complaint partaking of the nature of a malignant intestinal catarrh in most cases less serious and less intractable than dysentery. In Ceylon the same mode of distribution prevails, for this island not only shows a higher average mortality due to dysentery than India taken as a whole does, in the proportion of 2000 per million of population in the former case and 1300 per million in the latter, but it also manifests a rate of prevalence which is higher and a severity of type which is greater in the southern provinces than in those situated to the north. Thus for example in 1884 while the death-rate from dysentery was only 0·64 per 1000 in the northern province, it was as high as 3·11 per 1000 in the southern province. In the elaborate details relative to the public health of Ceylon during 1898 pub-

lished in two parts by Mr Allan Perry, principal civil medical officer and Inspector General of Hospitals, the writer says that during the year 64 hospitals and asylums were in operation. In these the total number of patients for the year amounted to 53564 and the total number of deaths to 5982. Of the deaths 1657 were classified as being due to diseases of the digestive system, a number larger than that recorded for any two other headings of disease, and of that number 1034 were the result of dysentery. This means that as many as 17·28 per cent of all deaths recorded during the year were attributable to dysentery alone. Moreover, the difference between the number of deaths produced on the one hand by this disease alone, and on the other by malarial fevers and diseases of the respiratory organs taken together, showed an excess on the side of the former amounting to no fewer than 758 cases of death. In the islands of the Eastern Archipelago comprising a large group situated in equatorial regions, the malady is very common, thus in Sumatra, in Banca and in Borneo it occurs both in endemic and in epidemic form, while in Java it is accountable for a third of the total mortality and is said to attack Europeans with great severity. The same remarks apply to the case of the Phillipine Islands, New Guinea, in short all the numerous islands of this group. With regard to China dysentery is said to be one of the commonest and most serious maladies in all parts with which we are medic-

ally acquainted, but along the south-eastern coast from Pekin to Foochow and Canton, dysentery occupies a very prominent position among the diseases of Europeans and natives. Passing westwards to Persia and Arabia, we notice that while the trouble is very prevalent along the southern coasts of these countries, it is comparatively rare inland. In Aden the disease occurs with such severity that it has, with reference to this place, been spoken of as "the most formidable disease, both as regards its frequency and its dangerous character". But when from such regions as these we pass to higher latitudes we cannot fail to observe a decrease in the occurrence of the disease, and in Siberia though not unknown in the southern districts, dysentery is seldom if ever found in the northern parts.

Africa. A very important seat of this disease is the tropical part of Africa, especially along the west coast of that continent. In Morocco, Algeria, Tunis, and Tripoli in the north it is exceedingly common, while in Egypt it ranks as one of the most fatal disorders. Next coming down the west coast we find not only that the trouble is of very frequent occurrence, but also that it assumes a very deadly type, at any rate so far as Europeans are concerned; this is especially the case in Senegambia. It is endemic and not infrequent in Sierra Leone, whereas in the Gold Coast it is said to be comparatively less common. Slightly to the east of this again, that is in Lagos, and over the

entire delta of the Niger it is very prevalent, as also in the Congo district and the whole of what is generally known as South Africa, including especially Cape Colony, Natal, the Transvaal, the Orange Free States, and the surrounding parts. Similarly on the east coast of this continent dysentery constitutes a very common condition, though in its type it is frequently less dangerous here than in the tropical parts of the west. In Abyssinia the wide distribution of the trouble has been noticed among the natives as well as in connection with the damage done among the British and Indian troops engaged in military operations there. In Zanzibar the disease occurs with great severity, in Madagascar it "takes the lead among the causes of death"(Davidson), in Seychelles it is very prevalent (though malaria is reported not to exist there),while in Mauritius dysentery occurs to such an extent as to cause a very high rate of mortality. Thus it is estimated to have caused together with diarrhoea on the average 72 per 1000 of the total deaths recorded in Mauritius for the period of years 1879-1889. The universal prevalence of the disease and the decided preference shown by it for tropical regions will be observed in the account given above of the distribution of dysentery in Africa.

America. In Canada dysentery is not uncommon among the Indian tribes, though less frequent among others. In Newfoundland the condition is said to be rare. But

passing from these high latitudes to those of the United States, it is at once noticed that dysentery is responsible for a very large proportion of admissions and deaths in this country. And not only so, but on looking into a table such as that prepared by Hirsch to show the average annual admissions and deaths from this cause among the military of the United States per 1000 men during a period of 21 years and according to the main divisions of the entire country, we see that both admissions and deaths occur in far larger numbers as we pass from north to south, that is from higher latitudes to more equatorial regions. Thus for example while 28 admissions and 0·37 deaths per 1000 were recorded in the districts around the Great Lakes in the period 1839-1859, 213 admissions and 4·32 deaths per 1000 were returned for the gulf-coast and interior of Florida during exactly the same period. It has not been found possible to make similar accurate observations in the case of the civil population of the United States for in the returns for this section of the people the head "diarrhoeal diseases" is made to comprise not only dysentery but also diarrhoea, cholera infantum and enteritis. In Mexico and Central America generally dysentery is extremely common, and here it is decidedly endemic, while every now and then it is apt to assume an epidemic form. The disease is also endemic in the West India Islands especially in Cuba and Jamaica. Next passing to South America we observe that in Bri-

tish Guiana dysentery accounts for a considerable proportion of the ill-health and mortality, though not to the same extent as in some countries of the East, but in Dutch Guiana the disease is indeed very frequent. In Brazil, Peru, Bolivia, in short in all the countries of the tropical regions of South America, dysentery is more common and more frequently assumes an epidemic form than in latitudes further south, the latter being represented by such countries as Argentina, Uruguay, and Paraguay from which places however the disease is by no means absent.

Australasia. It has been proved by means of statistics that the frequency with which dysentery occurs and causes death is far greater in the warm regions of the north than in the colder southern portions of that country. Thus whereas the average death-rate per 10,000 living was estimated to be 11·58 in the case of Queensland, it was found to be only 1·97 in New South Wales further south, and 1·37 in Victoria which is still further south. Extending our observations to the island of Tasmania which again is south of Australia, we notice that dysentery is less prevalent here than it is on the mainland. In New Zealand the disease is so distributed as to prevail to a far greater degree in the northern than in the southern parts of the island. Thus throughout the case of this continent too the general rule applies, namely that the malady we are considering prefers warmer and more equatorial latitudes to those that are

less so.

Europe. Verifying as it were the great dictum of Ayres' regarding the universal distribution of dysentery, the disease we find shows itself from time to time even in a place like Iceland which is as far as 65° N. It occasionally occurs there in sporadic form, though epidemics are not unknown. Thus in 1855 and in 1860 epidemics were recorded as having occurred along with typhus to a large extent and as having been associated with famine and food of bad quality. In Norway the disease is occasionally met with in sporadic form, but as Davidson says "it is rather noteworthy that the cases are more numerous in the north than in the south, a result which we should not have anticipated".

In Sweden dysentery is not of great importance as an endemic disease, though as an epidemic especially during the latter end of the past century it made for itself a great reputation. The last epidemic of this disease which was recorded in Sweden, occurred between 1853 and 1860, and was associated with an outbreak of malaria. In the Baltic and northern portions of Russia dysentery is scarcely known to exist, and the few sporadic cases which do from time to time occur are not of a very severe type. In those parts epidemics of the trouble do occasionally break out, the last occurrence of this kind having taken place in the Baltic provinces in 1845-1846. But coming down south and taking up the consideration of a belt of countries in latitudes some-

what lower than the preceding, we already notice a marked difference as to the prevalence of the disease. In England and Wales the mortality produced by dysentery was estimated to be 28 per million of population during the period of years 1871-1880. In Ireland the disease has produced even a higher death-rate than in England, for in the three years 1878-1880 it was found to be accountable for an average mortality of 36 per million. Conolly Norman writes of dysentery as having always been, until comparatively recent years, a relatively prevalent disease in Ireland. Sydenham termed the disease "the endemic dysentery of Ireland", while Cheyne has referred to the havoc wrought by it during the wars that devastated the country during the greater part of the 17th century. Writing of it as "the flux", the parliamentary General Ludlow, once in command in Ireland said, "many of ours were so distempered with the flux, that they were forced to fight with their breeches down". It was particularly prevalent in army hospitals and barracks in the early part of this century, and accounts have been recorded of epidemics which occurred in 1818 and again in 1846-1848 in Dublin. In Holland the death-rate from the same cause as calculated for the period 1879-1888 was 10 per million. Similarly in Belgium dysentery has been shown to exist to a considerable extent. In France it is an endemic disease in most parts, especially in the south; the average number of deaths from this cause

per 1000 of deaths from all causes has been estimated to be 12 in the case of five large towns in the country. In Germany dysentery causes a fairly large proportion of the deaths, especially in certain of the Prussian districts. According to some however, dysentery is said scarcely to be endemic in Germany, whereas epidemic outbreaks of it in the northern parts are of very rare occurrence. In Austro-Hungary the mean death-rate from this cause was 440 per million of population during the period of years 1885-1887. In Central Russia dysentery occurs in sporadic form and every now and again breaks out as an epidemic. Next passing down to the zone made up of the countries of southern Europe we note a still higher rate in the occurrence of the disease and in the mortality produced by it. In Spain and Portugal a very large proportion of the high death-rate constantly registered under the heading of"diarrhoeal diseases"is attributed to dysentery, whereas in Italy an average mortality of 220 per million was recorded for the years 1881-1886, as compared with the English average (1871-1880) of 28 per million, and with the Irish average (1878-1880) of 36 per million. The disease is endemic in Greece, while in Turkey according to Rigler, dysentery holds as prominent a place as it does "over the East generally".

Even this brief geographical survey of the trouble brings out the truth of the general statements made in the first lines of the chapter. The exceptionally wide

distribution of dysentery can hardly be doubted; the manner in which it prevails in various parts of the world and the special preference which it manifests for regions in equatorial and tropical latitudes are points which cannot escape the notice of even the most casual observer, whereas the fact that it does break out in epidemic manner in some countries such as Sweden where it scarcely occurs endemically, is noteworthy. Attention has moreover been drawn to the somewhat remarkable coincidence between dysentery and malaria in the matter of their general distribution, while at the same time some curious exceptions to the usual plan have been noticed, as for instance Iceland situated in a high latitude, and the Seychelles Islands situated on the other hand in equatorial regions, in both of which places dysentery is common although malaria does not exist. It just remains that I should, in concluding, draw attention to the fact in connection with the geographical distribution that dysentery prevails at various altitudes. I have already noted this with regard to its occurrence in India where, as I have stated, the disease has produced high death-rates both in localities at the level of the sea and in others at various degrees of elevation above the sea. The same holds good of others parts of the world, thus dysentery appears as often on the sea-coast as in the mountain valleys of Ceylon, as often in the plains as on the high mountains of South America.

Chapter III.

ETIOLOGY AND BACTERIOLOGY.

With the advance that has of recent years been made in medical science and in our knowledge of scientific methods, it has at the present period in the history of medicine been sufficiently well established that dysentery is a specific disease depending upon the action of a specific virus. Within comparatively late years I say, this fact has been recognised, though what the exact nature of the poison is, what the circumstances are that favour its growth, in what precise manner it gains access into the human organism, and how it operates in the spread of the disease are still points which require a good deal of elucidation. Physicians of ancient times understood to a considerable extent the nature of the morbid processes involved, they knew the prominent symptoms which characterised them, they recognised the seat of the lesion and were able to associate several causal conditions with the occurrence and spread of the disease. Thus for instance

they did not fail to observe that faults in the diet were in some cases an important factor in the causation of the disease, or that war, famine and other circumstances associated with overcrowding and malnutrition played a leading part in the production of the trouble on ~~the~~ larger scale. Again, as we see in the writings of Avicenna, seasonal conditions were taken into account as affecting the occurrence of dysentery. When however the present methods of bacteriological research culminated in the discovery by Losch, of the Amoeba Coli which he found in great numbers in a case of ulcerated large intestine in the human subject resembling true dysentery in all its clinical and pathological symptoms, physicians began to appreciate the difference between two sets of conditions concerned in the production of the dysenteric process. The one set consists of what might very well be called the predisposing conditions, whereas the other constitutes the actual exciting cause. In other words, it came to be understood that a certain organismal virus was associated with every true case of the disease, although the conditions of its growth outside the human subject, the mode of its entrance into the system and of its subsequent development therein as well as the type of the affection produced by the poison were not thoroughly comprehended but were merely regarded as being in all cases under the influence of one or more of a large set of predisposing conditions. Writing on the subject

of tropical dysentery in the early part of the century that is in 1819, Bampfield in his chapter on the etiology of the disease, refers to several conditions as affecting its occurrence, but of course he offers no suggestion regarding any specific cause. He lays great stress on the effects of checked perspiration in bringing about dysentery and he adds the observation that with regard to the period of the year, situations and in short the various circumstances under which the trouble prevails, they are just those in which some impediment arises to the free flow of perspiration. Thus with regard to the greater prevalence of the malady on the shores and coasts of woody uncultivated countries, as for example Sumatra, he says that in such situations much dew forms and falls, and that this affects Europeans exposed to them especially if "the perspirative vessels have been previously excited to inordinate action by spirituous liquors or violent exercise", for the latter, Bampfield is of opinion, "become the cause of checked perspiration". Further, the same observer indirectly associates in some measure the action of the moon with the occurrence of dysentery and he says that "dysentery and all diseases of the oriental tropics were most frequently induced at the plenilunar and novilunar periods, if lunar attraction (with other causes) produced, at these periods, fresh gales of wind and rain; but if neither fresh gales nor rain nor any unhealthy changes of the air or weather

were induced at the plenilunar or novilunar periods, they were not particularly remarkable for the induction of disease". In this manner, by consulting the works of various authors dating about the same time, it may be seen on what lines and how far their observations extended in the direction of associating cause with effect in the matter of this malady.

Now, I have said that the discovery by Losch of the Amoeba Coli formed practically the starting-point of the specific theory regarding the causation of dysentery. Since the time when he first discovered this organism in connection with the disease in question, numerous other observers have been able to confirm his discovery, as for example Kartulis, Councilman, Osler, Lafleur, Maggiora, Kruse and Pasquale. On the other hand, I may without entering at the present time into the bacteriology of the disease, mention that many who have worked at dysentery have missed the amoeba but have described various species of bacteria as connected with the disease. Thus our knowledge of the actual cause is still meagre and unsatisfactory, but although this is the case and notwithstanding the fact that much difference of opinion exists as to the exact nature of the micro-organismal agency concerned in the causation of the disease, observers at the present time are, I think, unanimous regarding the parasitic nature of dysentery.

But apart from the actual living organism which is

concerned in bringing about the trouble in question, there are several conditions which in a more or less important manner predispose to its occurrence. The nature of these and the bearing which each of them has upon our subject I propose to consider at the present stage, deferring for a brief period the discussion at greater length of the parasitology of dysentery.

(1) Climatic influences.

The connection between season and weather on the one hand, and dysentery on the other, either as an endemic of the tropics or as an epidemic of the temperate zone, is exceedingly well marked. In the study of the geographical distribution it was seen that the disease as an endemic occurs mostly in tropical countries whereas in the higher latitudes the endemic character becomes much less prominent and dysentery in these zones is found in epidemic form and in sporadic cases in which shapes it extends far north, even beyond the limits of malarial fevers as in the case of Iceland. Now, the relation which exists between the prevalence of dysentery and season and weather, resembles that which has been observed between the particular mode of geographical distribution proper to dysentery and climatic conditions. But what is the relation which exists between the seasons of the year and the manner in which dysentery prevails ? In places which are in the equatorial zone dysentery occurs at all seasons of the year hot, rainy and cold, as is the case in Lower India,

throughout the southern portions of Asia generally, in the equatorial regions of Africa and Central America, and in many islands situated about the same degrees of latitude. But on going more closely into the matter and consulting statistics made in relation to seasons of the year, it is seen that the disease occurs more frequently in the hot weather especially if this be associated with want of rain, and that it occurs most often in connection with the rainy season. This with regard to India holds quite good as far as the Europeans and I think also the civil section of the native population are concerned, while a curious exception to this rule occurs in the case of the native troops generally. In Bengal the statistics for the native army giving the death-rate from dysentery month by month for the years 1864-1873, show very clearly that the disease among this class of the people occurred chiefly during the months included between October and January corresponding to the cold season, whereas the smallest number of deaths from this cause was recorded against April, May and June, the hottest months of the year. In this instance dysentery shows a marked resemblance to malarial fevers with regard to the period of occurrence during the year. Again passing from these to higher latitudes, that is from equatorial to subtropical and temperate zones, it is seen that wherever dysentery occurs it does so chiefly in the period of transition from summer to autumn, and further that epi-

demics of the disease take place in such countries during similar periods of the year, except where war, famine or other like cause is instrumental in producing such an outbreak at another time. Generally however, it may be said that the end of the summer or rather the third quarter of the year favours the occurrence of dysentery. In Italy for example, in a report for the years 1881-1885, 5959 deaths took place from this disease, out of which 591 were recorded during the months of the first quarter, 1042 during those of the second quarter, 3100 during those of the third quarter and 1226 during the months of the fourth quarter. Among the troops of the United States during the years 1819-1860, 11.9 % of the cases of dysentery which occurred did so during the months of the first quarter, 21.7 % during those of the second quarter, 34.2 % during those of the third quarter, and 17.5 % during the months of the last quarter. Among the civil classes of the same country it was found by making observations over a prolonged period of years that the mortality from August to October in the year was roughly eight times as great as that from November to January, twelve times as great as that from February to April, and three times as great as that from May to July. Further north still the same conditions hold good, and in Norway for instance, out of 558 deaths from dysentery recorded in 1886-1887, the largest proportion occurred between August and November. These figures suffice to illustrate the manner in which

the disease has been observed to prevail with regard to seasons of the year.

The questions next arise as to why dysentery should prevail more in hot climates than in cold, and why it should occur more during the hot than during the cold months. Much has been said and written upon this aspect of the subject, but no very satisfactory explanation has been given. For example with regard to India and the great prevalence of the disease among the Europeans of India, it has been suggested that the use of highly seasoned and stimulating food and of bad water is an important factor in giving rise to the condition. Parkes writes about the "unusual proneness in the mucous membrane of the large intestine to be acted upon by the exciting causes", and he hints at our want of knowledge regarding the effects of a tropical climate on the different excretions and secretions of those who have been accustomed to cold and temperate climates. But whatever be the real explanation, it is at least certain that "like malarial affections, dysentery attacks by preference those who are not acclimatised to the conditions that have produced it"(Norman). On the influence however of climatic conditions in the causation of this disease several points have been definitely made out. Thus it has been stated that dysentery occurs most frequently in equatorial and intertropical regions, that in such places it occurs largely as an endemic disease and appears at all seasons of

the year. Further it has been noticed that in subtropical and temperate climates dysentery has not the same importance as an endemic, whereas in epidemic and in sporadic form it occurs in these latitudes and extends to higher ones. Moreover it has been shown that in the case of tropical countries the end of the hot and commencement of the rainy season is the time for the malady to be at its worst, while in countries with a temperate climate the period of transition from summer to autumn favours the occurrence of outbreaks; so that in both cases the disease has been observed to appear mostly during the seasons when the fluctuations of temperature from hot to cold are greatest and most sudden.

Thus we are led to the conclusion that dysentery as to its occurrence is not merely associated with heat but also with periods of sudden and great rise and fall of temperature as is the case in tropical countries when the hot season is passing into the rainy, and in temperate regions when summer is making way for autumn. More than this, it has been remarked that in regions where the mean temperature is high the disease both as an endemic and as an epidemic is extensive and severe, whereas it occurs less extensively and in milder form where the average temperature is an absolutely low one. Observation has moreover shown that in countries in the temperate zones a great fall of temperature has frequently been associated with the termination of an epi-

demic of dysentery, thus indirectly demonstrating the effects of high temperature in promoting the prevalence of the disease.

Nor are the conditions of excessive heat and of the great and sudden changes of temperature referred to, the only important factors concerned, for the presence or absence of rain and dew plays an important part. But the opinions of observers as to what part these physical conditions play vary considerably, for while some regard the presence of moisture in the atmosphere as favouring the occurrence of the malady, others take an entirely opposite view, while still others consider the presence of aqueous vapour in the air as a matter of indifference. Annesley who has written extensively on the diseases of India, is of opinion that in tropical countries " a moist state of the air conjoined with the greatest daily range or sudden vicissitudes of temperature" is the condition which conduces most to the generation of the disease. On the other hand historical records tell us of drought combined with excessive heat preceding severe outbreaks of the trouble, as for example in the case of the epidemic in Germany in the summer of 1583. Again, Hirsch believes that the presence either of dampness or of dryness in the air has no effect upon the prevalence of bowel-complaints. This observer also points out that with regard to each of the general observations made in connection with the influence of climate on dysentery there may be exceptions.

Thus he remarks that in many places in the tropical zone neighbouring upon the favourite haunts of dysentery and resembling these in every respect as to climate, this disease is comparatively rare; that although an entire large tract of country may be under exactly the same weather influences, yet outbreaks of the disease may in some cases remain confined to a very small area or to a special section of the population; that although conditions of weather in the form of hot summers, with or without abundant rains, have been such as to favour the outbreak of the disease, yet in many cases such outbreak has not occurred; and finally that the trouble has often come about when on the other hand the weather has been quite mild or steady.

Such then are the main observations on the influence of climate in relation to the etiology of the disease under consideration. It is of course very evident that none of the conditions referred to under this head is to be looked upon as the real factor concerned in the production of the malady, though each and all of them may have an important bearing in promoting its occurrence or otherwise.

(2) Telluric influences.

Nothing very definite has been established in the way of a connection between the prevalence of dysentery and either the physical configuration or the geological conformation of the earth, for dysentery seems to exist anywhere and everywhere. When considering the

geographical distribution of the disease I pointed out how it was to be met with equally on hill-tracts of considerable elevation, on high plateaux, in valleys, and on plains at or about the level of the sea. Similarly it may occur on practically every variety of soil with equal severity of type and extent of diffusion, from the firmest rock to the most porous and loose soil. "Nor", says Hirsch, "has the assertion often made that chalk soil enjoys a special immunity from dysentery, been in any way established". I have already alluded to the somewhat remarkable analogy that has been observed to exist between dysentery and the malarial group of diseases with regard to their distribution; the observation of this resemblance has however afforded no clue to any definite conclusion regarding the influence of telluric conditions upon the occurrence of dysentery.

(3) Hygienic influences.

Reference has been made to the manner in which the disease occurs in connection with war and famine, conditions which tend not only to lower the general vitality, possibly helped by unfavourable climatic circumstances, but also to bring about overcrowding associated with an inadequate food-supply or an improper water-supply. Historical accounts of such war- epidemics of dysentery are exceedingly numerous and date from the most remote periods up to modern times, since the disease is reported to be prevailing even in the

course of the war at present proceeding in South Africa. Graphic accounts by Dr Mayne are available regarding a serious epidemic of dysentery in Dublin during the year of the great Irish famine and the two succeeding years, that is from 1846 to 1848. Similar records tell us of more or less extensive outbreaks in various parts of India during the great famine that prevailed there some five years ago. It is not difficult to conceive the occurrence of the disease under such circumstances of destitution and want as must prevail in times of famine among large multitudes of population, or under circumstances of overcrowding in conjunction with inadequate supplies of food and water as must be the case in times of war or during prolonged sieges. Nor is it difficult to imagine large outbreaks having occurred in prisons in former times when ideas regarding sanitation were advanced neither in theory nor in practice as much as they are at the present time. But when we come to think of the extreme prevalence of dysentery even in modern times in institutions such as prisons where hygiene is the first consideration, where overcrowding is systematically avoided, where the greatest care is taken to supply a sufficiency of only wholesome food and pure water, when, I say, we come to think of the manner in which the trouble so often prevails under these circumstances we cannot so readily account for the occurrence. My experience with regard to this disease in connection with

several prisons in Bengal and especially the large jail at Barisal convinced me that far from any overcrowding or unsuitable food or defective sanitation being accountable for the large amount of dysentery to be found in those institutions, the condition of the prisoners was infinitely superior to what they were accustomed to dwell under in their native villages, in matters of food and water-supply, occupation and general hygienic surroundings. And yet the mortality from this cause is higher than what it is among the rest of the civil population in the proportion of something like 19 to 1. Baly's observations in connection with the Millbank Prison point to the moist nature of the subsoil, loaded with the products of organic decomposition, as having been concerned with the extensive occurrence of dysentery in that institution. Thinking at first that the disease there was due to faulty diet of the prisoners the authorities improved the diet, but the trouble became worse; next the prison was emptied for a time in the hope that dysentery would thus be got rid of, but twenty-two years after a repetition of the same condition was recorded. Baly thereupon suggested improvements in the drainage, and when these were effectually carried out the disease no longer appeared. Similar observations were made by Clouston in connection with the Cumberland and Westmorland Asylum and were recorded in his report of 1865 upon the epidemic of dysentery in that institution in the years 1864-1865. This

leads us to a short consideration of the manner in which the malady has been found to exist in lunatic asylums. Here apart from overcrowding and other faults common to public institutions, importance has of recent years been attached to the general lowering of vitality and power of resistance to disease observed in many forms of insanity as favouring the occurrence of dysentery. Clouston associates "diminished nervous energy rather than impaired nutritive power" with the disease under these circumstances as its chief predisposing cause. In the account of the particular outbreak in question the writer attributes the causation to the effects of effluvia from a neighbouring "field irrigated by sewage".

(4) Dietetic influences.

Taylor remarks that "sporadic cases of dysentery are attributable to unsuitable or irritating food, such as bad meat, or unripe fruit, or to drinking-water impregnated with organic matter". Considering however that dysentery is a specific disease, the effects of errors of diet are merely of a predisposing nature. It may be that such cause sets up in the first instance an acute attack of diarrhoea which passes on to dysentery, a sequence of events often noticed, as Bampfield remarks when he writes that "violent diarrhoea sometimes induces or is succeeded by dysentery". The explanation of the influence of faults in the diet in causing the disease is probably that such faults tend to lower the vitality of the individual through the

alimentary system, and thus either directly by the production of irritation and the absorption of noxious substances, or indirectly by the production of violent diarrhoea to begin with, they favour the onset of the more formidable complaint. The influence of irritating diet, including alcoholic stimulants, upon the action of the liver especially in tropical countries, has according to Parkes not received sufficient attention in the study of the etiology of dysentery. Several observers have suggested that the degree of stimulation caused by various articles of diet very often amounts to an irritation, the result of which is that the action of the liver becomes interfered with to the extent of setting up a form of diarrhoea known as bilious; this"bilious diarrhoea" Bampfield writes, "excites dysentery owing to the stimulus of the vitiated bile". But whatever be the explanation in full of the manner in which stimulating food and drink tend to give rise to the dysenteric process, certain it is that the ingestion of the former is intimately associated with the induction of the latter, and also that the primary factor linking the two conditions together in the light of cause and effect is a certain lowering of the vitality produced by the former. I have mentioned that the nature of such cause is merely predisposing in some measure, and the truth of this statement can be realised very readily. Take for instance the case of a public institution such as a large prison. Here there

is under observation at one and the same time and place a large number of inmates, taken for the most part from the same ranks and conditions of life and kept on the same diet which is of a very simple and wholesome nature (including for example in the case of the Barisal Jail fresh milk, fish, meat, rice, ordinary vegetables, etc.) and yet only a certain proportion of this population develops dysentery. In practice the physician is often able to trace an attack of this disease, especially in the case of a child, to some indiscretion committed in the matter of diet, such as the eating of unripe fruit, whereas in many cases a similar fault in diet is unattended with any such formidable result. An interesting case in point occurred in the course of my practice in Calcutta when a boy of ten years of age took ill with what was said to be "a severe attack of pain in the stomach and purging". On examining the case I found it to be one of dysentery and on eliciting the history of the attack I discovered that the lad had been indulging in a quantity of unripe "guava"(a pear-shaped fruit which grows very common in Bengal). But the noteworthy point was that the boy's brother, of twelve years of age, had partaken on the same occasion of a similar quantity of the same unwholesome fruit and he escaped without any trouble except a slight griping pain in the region of the abdomen and a single loose stool. In the case of the younger child pieces of the undigested fruit and quantities of the small

irritating seed which the fruit contained were found in the stools in the early stage of what afterwards turned out to be a sharp attack of dysentery. Here we have an illustration of the manner in which similar errors of diet in two individuals apparently under the same conditions produced vastly different results. The conclusion from this manifestly is that while the irritation set up by the unwholesome article of diet predisposed to the occurrence of dysentery, there must have been a something present in the first case (which was absent in the second) to actually give rise to the trouble.

In short then any agency which is able either mechanically or by chemical action to set up an irritation of the intestinal mucosa, can at the same time directly or indirectly favour the occurrence of dysentery. Under this head therefore must be considered not only such unwholesome articles of diet as have been hitherto referred to, but also impure drinking-water. The impurity in such water may be due to contamination with (1) inorganic matter, either insoluble constituents or soluble salts, especially sulphates, and (2) putrefying organic matter. There is some diversity of opinion as to whether water containing a considerable proportion of insoluble inorganic material causes irritation of the intestines and sets up disorders of the bowels or not. But authorities generally are unanimous in condemning for drinking purposes water charged with a large amount

of soluble inorganic salts such as the sulphates of soda and magnesia, as well as brackish water, on the ground that these are particularly liable to set up diarrhoea and dysentery. As regards water polluted with decaying organic matter, vegetable and animal, and used for drinking purposes, there is a large class of observers who look upon it as of the highest importance in setting up the disease. Some have attempted to draw a fine distinction between the effects of such water as taken from rapid streams and as drawn from stagnant pools. Of course while it is evident that in the former case the contamination of the water may exist to a less degree and in the latter case to a greater degree, yet granted that the water is impure from such causes as those enumerated above, it cannot be argued that the use of it for drinking purposes is attended with anything but risk, to say the least of it. For, the inorganic matter will act as a more or less violent irritant, the more so the greater the amount in which such impurity exists in the particular sample of water considered. Virchow says "impure drinking-water, tainted with organic matters in process of decomposition, is justly under suspicion of being able to call forth both typhoid fever and dysentery".

The relation of drinking-water supply to the occurrence of so important a disease as dysentery is liable to be overlooked by those who limit their attention to large towns where in modern times in all civilised

countries a wholesome water-supply is secured for the good of the general public. But when it comes to selecting a suitable site for a camping-ground or to superintending the sanitary arrangements in connection with large fairs such as are held so frequently in rural districts in India far away from the conveniences of towns, the matter of ensuring a proper supply of wholesome water for the use of a very large number of people assembled in one place comes to be of the very highest importance. The same considerations would hold good in the selecting or approving of a suitable spot for the purpose of establishing a pilgrim-camp or an emigration depot where one is required at an emergency.

(5) Age, sex and occupation.

All ages are liable to the occurrence of dysentery, but children are if anything more prone to the disease than adults and old people. Both sexes are liable, but perhaps not equally so. Both in general and in jail practice in India I met with far more dysentery among the male than among the female sex, but for several reasons I am inclined not to allow my Indian experience to guide me entirely in making any definite assertion regarding the relative liability of the two sexes to the disease in question. For, in the particular country referred to the seclusion of women is in many parts so strictly enforced that, I believe, medical observation fails to define anything like the exact extent to which various diseases occur among the female

sex; thus it is that I consider any figures which my experience may afford upon the matter of the relative frequency of dysentery in the two sexes, would not represent what must be the actual state of affairs. Among European and other communities resident in the same country, I believe that dysentery occurs distinctly more often in the male than in the female sex. Occupation in itself has perhaps no direct influence in the causation of the trouble, but indirectly it may come to be an important predisposing factor. It seems reasonable to believe that if the nature of a person's occupation in life exposes him to conditions tending to lower the vitality or otherwise to render him less able to resist the onset of disease in general, that he will be more liable to be attacked with dysentery than others who are not so exposed.

Scorbutus and Dysentery.

It has been observed that cases of dysentery occur from time to time in which besides the ordinary signs and symptoms of that disease, others manifest themselves which clearly show the existence of a scorbutic element. From the purely etiological point of view the exact relation between these two conditions which sometimes coexist, is a little difficult to make out. In cases of this kind it is usual to find on the one hand the history of a long-standing deficiency in the fresh vegetable constituents of the diet to account for the scorbutic symptoms, and on the other hand an account of

overcrowding or of an improper (perhaps brackish) water supply or of adverse conditions of climate to account for the predisposition to dysentery. This combination of circumstances not infrequently exists in the case of sailors and also among fishermen as I have sometimes seen on the coast of the small island of Sundeep (Sandvip) in the Bay of Bengal. When once this twofold process gets started off each element appears to help in keeping up the other, for while the depressing circumstances associated with the dysenteric process help to increase the condition of scurvy, the devitalising influence exerted by the latter through the changes in the blood aggravates the trouble in connection with the bowel. The manner in which these two diseases are at times associated with one another has long been observed and has been put on record by many writers. Thus Bampfield writing in the beginning of this century mentions scurvy as a cause of scorbutic dysentery, and Parkes some years later quotes among other causes of the disease "alterations in the blood, effected by some peculiar and at present (1846) unknown changes in the process of assimilation", and he goes on to say that scorbutic dysentery is the most prominent example of this type. The co-existence of the two morbid processes is however more important from the points of view of diagnosis, prognosis and treatment.

Malaria and Dysentery.

More important is the manner in which malaria is

so frequently associated with dysentery. The first point that was considered in the study of the relationship between these two important conditions was the circumstance that they corresponded in a general manner with regard to their geographical distribution. It was noticed that they both showed a somewhat marked preference for the equatorial and tropical latitudes generally and that on the whole they resembled as to the conditions of climate, season and weather which conduced to or favoured their occurrence. For example, both dysentery and malarial affections reach their maximum of diffusion and intensity in inter-tropical latitudes, they both prefer the same seasons of the year, and moreover they flourish best in damp marshy localities such as the swamps existing in some of the districts of Bengal about the delta of the Ganges. In fact in so many features do these two conditions resemble one another, that they have even been considered by some observers as identical in respect to their cause and origin. Annesley is greatly impressed with a sense of the malarial nature of the origin of dysentery, for in his works such passages as the following are to be met with, "the majority of the most prevalent maladies within the tropics, more particularly the different forms of fever and dysentery, are chiefly owing to the exhalations proceeding from vegetable matter in a state of decomposition". Again he writes "of dysentery as well as of fevers it may be confidently stated,

that all situations productive of terrestrial emanations of malaria, and which furnish exhalations from the decay of animal and vegetable productions, under the operations of a moist and hot state of the atmosphere, will always occasion dysentery in the predisposed subject". Now, it is evident that the poison of dysentery has strong analogies with the poison of malaria, and it is well known that dysentery exists most frequently in the places and at the times during which malarial fevers most abound; these facts have been observed and demonstrated in the case of England, Ireland, India and many other countries. But the position which a large class of observers of whom Annesley may be taken as the type, takes up comes practically to be that of considering the two conditions identical in the matter of their origin since they are similar with regard to the period and locality of their occurrence in endemic and epidemic forms. This view has been very ably contested by Morehead, Hirsch, Davidson and others. These writers point out that although malaria and dysentery have on the whole a very similar geographical distribution, yet they are by no means identical even in this respect. For instance, in many places such as Gujerat on the west coast of India, swamps and malaria abound but dysentery is of rare occurrence except when caused by such accidental circumstances as war; again in many localities such for example as the isthmus of Suez or the island of Rodrigues, malaria does not exist

though dysentery is to be found prevailing to an enormous extent. In the case of Rodrigues this disease caused no fewer than 29.6 per cent of the total mortality in the year 1887. The manner in which it was formerly insisted that dysentery was related to intermittent and remittent fevers, was not strictly based upon etiological considerations, but was "to be accounted for by the disordered state of the portal circulation, which, occurring in ague, led indirectly to the inflammatory affection of the colon" (Warburton Begbie).

The differences which exist between the diseases in question are noticeable not only in connection with their endemic prevalence but also with regard to the manner in which they occur as epidemics, so much so that whatever be the exact relation between them, we may from our present knowledge say at least that much of dysentery is not associated with malaria. But while this is the case on the one hand, still on the other it cannot be asserted that there is no connection at all between malaria and dysentery in the matter of the causation of these complaints. It has frequently been noticed, especially in tropical countries, that dysentery is very apt to supervene in those who have recently suffered from and been weakened by fevers of the malarial type. In fact this particular sequence of events is so marked in the case of Bengal and similar localities abounding in low marshy plains, that clinicians have given to this form of the disease the name of

"malarial dysentery" and have endeavoured to distinguish it as being characterised more by an insidious asthenic course than by the acute inflammatory course of ordinary dysentery as it occurs in the drier regions of upper India. These however are not to be looked upon as different diseases. In the one case the cachectic condition into which malarial disease has thrown the patient accounts for the chronic nature of the subsequent dysenteric process, while in the other instance there is no such complication. So that while malaria has a tendency to modify the form and course of dysentery it at the same time favours the predisposition to the disease, for by lowering the vitality of the individual it renders him less able to resist the invasion of the specific virus responsible for the occurrence of dysentery.

From the clinical point of view the relation which the one condition bears to the other is a matter of considerable practical importance, for their co-existence in the same patient has a direct bearing upon the symptomatology, diagnosis and treatment of the case.

Predisposition of new comers.

The manner in which new comers are predisposed to such bowel complaints as diarrhoea and dysentery, is similar among all races of people. A difference is apt however to arise when imperfect hygienic conditions become a factor and also when there is a question of migration from higher latitudes to tropical regions. The appearance of dysentery from time to time and the more

frequent occurrence of diarrhoea, often mild though sometimes severe, in the case of Europeans going for the first time to such a country as India, has come to the notice of most Anglo-Indian medical practitioners. Of course several casual elements come into play to predispose to these maladies in such a case, as for instance the influence of a tropical climate so totally different from what the individual has hitherto been accustomed to, the mode of life so much less active, the diet a great deal more irritating. Moreover, in the tropics generally, conditions such as anaemia, malaria, etc. may occur in new comers, debilitate them and thus render them more liable to be attacked with dysentery. Similarly it has been observed that when an epidemic of dysentery is present in a place within temperate latitudes, it is always the new comers who are particularly attacked by the disease.

Bacteriology of dysentery.

Apart from all conditions hitherto discussed, each of which, as I have pointed out, is an important predisposing factor concerned in the etiology of dysentery, I have now to deal with the virus of the disease. Regarding this virus a great deal has been done in the way of research and much has been written within recent years, and although its exact origin and nature have not as yet been brought to light, it has I think, been rendered more than probable that the poison is of organic

character, or indeed, parasitic. The fact that the disease under consideration is one capable of transmission from one person to another, and from one place to another, was realised many centuries ago, but it was not until so recently as some thirty years ago that any search after an organism was instituted in connection with this disease. The results of investigation hitherto made have not gone very far in establishing the real nature of the infective matter of dysentery, but inasmuch as the modes of research are constantly bringing to light fresh facts calculated to increase our knowledge of the subject, a short review of all that has been done in this connection and of the opinions of authorities will be appropriate at this stage.

M. Lambel (or Lambl) is said to have been the first to have come upon the amoeba in a case of intestinal inflammation.

Hallier, in 1869, devoted himself to the search for an organismal cause in relation to dysentery. He discovered the spores of a fungus in the intestinal contents of patients suffering from this disease but he ventured no opinion as to whether or not these were in any way concerned with the production of the malady.

Basch, in the same year, reported upon the result of the observations he made in Mexico upon the same subject. He performed many autopsies on victims of dysentery and discovered, according to his statement, many mycelial threads and micrococci in the villi of the

small intestine, in the crypts of Lieberkuhn in the small and large intestines, as well as in the veins of the submucous coat.

A few years later, in 1875, Losch of St. Petersburg, found in a case of dysentery in the human subject, what is described by MM Debove and Achard as "une grande quantite de corps protoplasmiques, granuleux, pourvus de vacuoles, capables de locomotion par allongement de leur protoplasma en pseudopodes". To these Losch gave the name of "amoeba coli". Further, he followed up his discovery with a series of experiments, and by injecting the organism into the intestines of dogs he set up diarrhoea with ulceration of the large intestine.

In the same year, Treille, a French observer, found Paramaecium coli in the stools of six out of nine dysenteric patients under his care. This parasite he always came upon when the stools contained blood, and never when they were bloodless. He gives no opinion as to the manner in which the organism and the disease might be related to one another.

In the following year, 1876, M. Normand and his colleague M. Bavay discovered the Anguillula stercoralis, one of the family of Nematodes, in the stools of patients suffering from dysentery; this parasite is said to resemble the filaria sanguinis hominis (f. Bancrofti) More recent investigations have shown that the importance attached to this discovery of Normand and Bavay's has been too great.

Moty (F), in 1881, discovered monads and low forms of parasites of various kinds in the dejecta of those suffering from dysentery during an epidemic outbreak at Bourges, but he did not regard these as the cause of the disease.

Cunningham was among the first who tried to cultivate the amoeba in 1881. The means at his command were not great, as his attempts were made in the days prior to the establishment of proper methods of bacteriological culture. The value of the results he obtained on that occasion was questionable since the media he used in the course of his investigations were not demonstrated to be sterile before he employed them. Since then however he has obtained excellent cultures of the amoeba, and, like Calandruccio, he has demonstrated resistant forms of the organism, the "encysted amoeba", even after the administration of calomel.

Mackie (J), in 1882, suggested that a variety of dysentery found in Egypt was caused by the Distoma haematobium (Bilharzia haematobia or blood-fluke) belonging to the family of Trematodes and existing chiefly in Egypt. It has, however, been shown that the phenomena of disease produced by this parasite are not those characteristic of dysentery.

Koch (R), examined the stools of dysenteric patients as well as preparations of the large intestine of those who died of dysentery both in India and in Egypt. In 1883 he was able to confirm the observations previous-

ly made by Losch, since he found the amoeba constantly present in the preparations which he examined.

Kartulis (S), of Alexandria, in 1883, took up the study of the subject. He made observations on some 500 cases altogether and examined the characteristic bloody stools and the intestines of tropical dysentery, as well as the liver-abscesses associated with that disease. He found in them numerous amoebae identical with those described by Losch and showing active amoeboid movements. Having obtained these, he cultivated them in straw-infusion and injected portions of this culture into the intestines of cats, and as the result he succeeded in setting up an affection characterised by ulceration of this portion of the alimentary canal. Kartulis regards this organism as the cause of dysentery, although he is not supported in this opinion by others who met with similar amoebae in cases of intestinal disease in Russia (Massiatin). Further, Kartulis made observations in 20 cases of abscess of the liver complicating dysentery, and although he was unable to find amoebae in the pus of the abscess cavity, he discovered in every one of the cases the characteristic dysentery amoebae demonstrable in sections through the walls of the abscess. In the description of a case quoted by Dr Leahy to show the relation of dysentery to a single large abscess of the liver, the writer mentions that Cunningham of Calcutta discovered the amoeba coli in the pus obtained from the abscess; this was in the

month of December, 1894. Kartulis worked at this subject for many years and in 1887 he published his results.

Woodhead (G. Sims), in 1885, mentioned the presence of numerous micrococci to be found on careful examination of the shreds of sloughy tissue which have become separated from the intestine in a case of tropical dysentery.

Hlava, in 1886, succeeded in isolating the amoeba. He produced dysentery in animals by injecting per rectum material containing the amoeba, and in some cases suturing the anal orifice, in others not.

Hirsch (A), writing in 1886, expresses uncertainty as to whether there is but one "dysenteric virus", as to whether one and the same morbific cause underlies the endemic dysentery of the tropics and the dysentery that becomes epidemic in temperate climates, and as to whether the form of chronic intestinal catarrh known in India as the "hill diarrhoea" or the "white flux" is due to the same cause as the endemic dysentery of that country.

MM Chantemesse and Widal (F), in 1888, reported having discovered in the stools of dysentery patients a micro-organism which, when injected into animals, produced diarrhoea with ulceration of the intestine. This organism which was a short motile bacillus, they obtained from five cases of tropical dysentery. They introduced cultures of it into guinea-pigs by inoculation,

by the mouth, and by the intestines after laparotomy, with the result mentioned above. The microbe in question has been looked upon as the bacillus coli communis with a specially acquired virulence in these cases.

Grassi and Schuberg, amongst others, succeeded after a series of researches, in demonstrating the presence of the amoeba in the foeces of healthy individuals, also in those of persons suffering from chronic diarrhoea, cholera, tubercle of the intestines, typhoid and other conditions. Moreover, Schuberg found this organism in ten out of twenty loose stools produced by the action of Carlsbad salts in otherwise healthy persons. The conclusions he arrived at from the observations which he made were that the amoeba is a harmless parasite normally existing in the caecum and in the ascending colon, also that owing to the acid reaction of the contents of the large intestine these amoebae often get destroyed and thus fail to be observable in ordinary foeces.

Osler (W), of Baltimore, in 1890, reported upon a case of dysentery with abscess of the liver, which originated in Panama and in which the amoebae were found in the stools as well as in the pus taken from the abscess. He is of opinion that the disease is associated in its etiology with the Amoeba coli (Losch) and the Amoeba dysenteriae (Councilman and Lafleur). Osler moreover recognises that the amoebae are occasionally to be found in the stools of healthy men.

Ziegler made many observations in an epidemic of dysentery in Germany and discovered the presence of a small bacillus, either scattered or in masses, in the adenoid tissue of the intestinal mucosa, within the crypts of Lieberkuhn and under their epithelium, as well as in the connective tissue. He showed that this bacillus when it increased, produced inflammatory and degenerative changes, but it yet remains to be proved that this microbe is the cause of the disease with which it has been found by Ziegler to be associated.

Dock (G), of Philadelphia, in 1890-1891, was able to demonstrate the presence of the amoeba coli in many cases and he became a supporter of the observations originally made by Losch.

Councilman (W.T) and Lafleur (H.A), in 1891, devoted much attention to the study of dysentery. They not only described the clinical features and the anatomical lesions in a series of cases observed in Professor Osler's hospital-wards, but they also carefully worked at the subject in relation to its bacteriology. They discovered amoebae in dysenteric stools in 13 out of 15 cases, while in the two other cases the organism was found in the scrapings taken post-mortem from the base of the ulcers as well as in sections of those ulcers. The number of the organisms found varied in different cases; they were generally easy to discover, but not always so; in some instances the amoebae were to be seen moving about actively. These observers noticed that the

organisms were more often present and more numerous in the early stages of acute cases, and also during the exacerbations of chronic cases. Moreover, they came upon actively motile amoebae in the sputum of patients in whom liver abscesses, associated with dysentery, had spontaneously evacuated through the bronchi. Councilman and Lafleur are of opinion that where the stools of dysenteric patients are not examined shortly after they are passed, the amoebae are apt to be missed as these organisms very often disappear from the stools in the course of a few hours. These observers gave the name of "amoeba dysenteriae" to the form of the parasite believed by them to be pathogenetic with regard to dysentery.

Ogata (M), of Japan, in 1891-1892, during an epidemic of dysentery in that country, obtained a small bacillus in the stools and intestinal ulcers of that disease. This organism as he demonstrated, had rounded ends, moved with great activity and formed greenish-yellow colonies in plate cultures; moreover, when injected into the rectum of cats it produced dysentery.

Maggiora (A), writing in 1892, attributed to the "bacterium coli" an important role in the etiology of dysentery. This organism, which Maggiora found in the foeces of affected persons during an epidemic of dysentery, existed along with the bacillus proteus vulgaris and other forms of bacteria.

Kovacs (F), in 1892, obtained the same results as

Hlava had previously got in connection with inoculation experiments with the amoeba.

Musser (J.H) of Galveston N.A., in 1892-1893, and Lutz of Brazil, demonstrated the presence of the amoeba in many cases of dysentery and confirmed the observations of Losch.

Quincke (H) and Roos (E), in 1893, made a series of experiments by feeding animals with material containing the amoeba, and so far as I am aware, they are the only experimentalists who have succeeded in obtaining positive results by employing the "encysted" form of the parasite which in all probability is better able to withstand the destructive action of the gastric juice. These observers recognise three forms of parasitic amoebae, two of which they believe to be pathogenetic.

Laveran (A), in 1893, was unable to discover the amoeba coli in the stools of patients suffering from a form of dysentery which prevailed in France, though he was able to find the organism in the case of a patient who had contracted the disease in Tonkin. Owing to this and to similar observations, Laveran and other observers while not denying the existence of the amoeba of dysentery, believe that the form of the disease to be met with in Europe is not due to that parasite. But on the other hand the amoeba has been discovered in the stools of either healthy subjects or those affected with various intestinal conditions such as cholera and typhoid fever.

Gasser (J), in 1893, published the results of his observations in 153 cases of dysentery. Out of 109 acute cases from among the total number, he found the amoeba coli in 45, but he noticed no special connection between the number of amoebae present in the stools and the severity of any particular case. Further, he obtained the amoeba in 13 out of 34 cases of chronic dysentery, in 5 out of 8 of chronic diarrhoea following upon dysentery, and moreover in the stools of 4 out of 20 healthy persons residing in the same town. He did not find the amoeba in stained sections of the dysenteric bowel. The conclusions which Gasser arrived at were that the amoeba is not the cause of the disease, that its presence is merely accidental, and that dysentery is the cause rather than the effect of the amoeba, in other words that the medium afforded to the amoeba by the dysenteric discharges constitutes an excellent pabulum for the growth of that organism.

M. Zancarol, in the Congres de chirurgie of 1893, held that dysentery as well as abscess of the liver associated with dysentery were due to pyogenic streptococci.

Kruse (W) and Pasquale (A), in 1894, made many observations upon fresh dysenteric stools, the contents of liver abscesses, and various organs removed post-mortem. The results of their researches were such as to allow of a comparison in the distribution of the various organisms in the affected tissues. In 100 cul-

tures made from the above materials they found various streptococci in 50, the typhoid bacillus in 25, besides also the bacillus pyocyaneus, a bacillus resembling the pseudo-diphtheritic bacillus, and the staphylococcus pyogenes; but they found none of these organisms to be so constantly present or in such numbers as to suggest any specific relation to the dysenteric lesion. In the cases examined post-mortem the organisms were always found in large numbers in the blood of the portal vein showing that direct absorption from a breach of continuity in the intestine is probably what takes place. Cats were subjected to inoculation but with negative results, from which however it must not be concluded that these organisms associated with the disease possess no pathogenetic property; they should rather be looked upon as being not of primary importance in the causation of the disease. The same observers made further experiments from the results of which they concluded that the best course would be to regard the "amoeba dysenteriae"(Councilman and Lafleur) as the pathogenetic organism of this disease, and to consider the "amoeba coli"(Losch) as a non-pathogenetic form found in the normal healthy intestine.

Calmette (A), who made his observations in Saigon in 1894, attached considerable importance to the bacillus pyocyaneus whose effects, he believed, were increased in presence of streptococci. He considers this organism to be the only one capable of producing the lesions

of dysentery when injected into animals.

Silvestri (H.de), in 1894, made a series of researches the results of which he published in the following year. He based his enquiries upon the bacteriological examination of the characteristic stools described by him as lemon-yellow in colour, liquid, with lumps of blood-stained mucus and emitting a very marked foecal odour. On making a microscopical examination of these stools he found in them particles of undigested food, debris of epithelium, red blood-corpuscles, and numerous bacteria among which a diplococcus predominated largely. A culture made from this yielded a number of colonies composed almost exclusively of this diplococcus which was round, stained with difficulty, was not coloured by Gram's method and did not liquefy gelatine. This organism was moreover found to grow very rapidly in different media. A culture of the diplococcus mixed with sterilised water and injected per rectum into a dog and two cats produced diarrhoea which closely resembled that characteristic of dysentery, the stools containing the diplococci. The conclusion which Silvestri came to was that several varieties of dysentery exist due to specific micro-parasites but that the origin of the evil in the epidemic observed by him was the diplo coccus in question.

Arnaud (O), in 1894, expressed his belief in the theory propounded two years previously by Maggiora attributing to the bacterium coli commune a very import-

ant role in the etiology of the disease under consideration.

Bertrand (L.E) and Baucher, in 1894, reported having discovered the following micro-organisms in dysenteric stools during an epidemic in hot countries, septic anaerobic vibrios, streptococci, staphylococci pyogenes (aureus, albus and citreus), the bacterium coli commune and the bacillus pyocyaneus, and to the last of these they believe dysentery to be in greatest measure due. They also established the presence of these organisms, but with certain differences in their relative proportions, in the dysentery which occurs in France.

Celli (A) and Fiocca (R), two Italian observers, in 1895, published the results of their study of 62 cases of dysentery from Italy and Egypt. They are of opinion that the disease is not caused directly by the amoeba coli. This opinion they based upon the observations (1) that dysentery in any of its forms may occur without amoebae being present in the stools, (2) that the disease may be brought about by the entrance into the alimentary canal of dysenteric foeces which have, blew microscopically demonstrated to be free from amoebae, and (3) that the amoebae being very common in countries where dysentery abounds, their frequent occurrence in the stools of patients affected with the disease can be explained on grounds of accident. According to them the amoeba coli is only one of many forms of amoebae to be found in the intestine and it has come into pro-

minence because, owing to its form and size, it is easier seen and more readily cultivated than such other forms as the amoeba guttula, diaphana, vermicularis, oblonga, reticularis, etc. Instead then of adhering to the opinion of Losch, Celli and Fiocca say that the bacterium coli commune, usually non-pathogenic, has the power of acquiring a very special virulence and they further assert that it is the cause of dysentery. They hold that this bacterium is always present in the characteristic stools of dysentery. They state that it frequently co-exists in the intestine with a bacillus resembling that of typhoid fever and with certain forms of streptococci, and that all of these are able on entering the intestinal canal to produce dysentery. The bacterium coli commune, according to them, is able to acquire the specially virulent property referred to, under certain favourable circumstances and in the presence within the intestine of the other forms of organisms, and to the bacterium coli so altered in character they give the name of "bacterium coli dysenteriae". Celli and Fiocca maintain that a specific toxin which is produced by this virulent form of bacterium, is capable of retaining its active property when carried from one person to another. This poison can, according to them, be thrown down in cultures by alcohol and it is able to produce the disease when introduced hypodermically, injected by the anus or administered by the mouth. These conclusions require to be confirmed

by experimental methods in order to establish their value but there are great difficulties in the way of this being done. Celli and Fiocca made their observations on cats, an unsatisfactory method considering the peculiar manner in which these animals are liable to be affected by the dysenteric processes on the introduction of almost any irritant. In a more recent report of the researches of these observers it is stated that they have succeeded in obtaining a pure culture of the amoeba which they have described as having two stages of existence, namely, the amoeba stage in which they multiply by fission, and the cystic stage.

Klein (E), writing in 1896, says that from a careful consideration of the bibliography upon this subject "there can be little doubt that what is clinically spoken of as dysentery is not one single disease in etiological respects, since some dysenteric affections are, others are not caused by the amoeba coli".

Davidson (A), who studied dysentery both at home and abroad in the tropics, writing in 1897, formulates a series of conclusions which he has arrived at regarding the bacteriology of the disease. His inferences are based upon both his own observations and those made by others on the same subject. He does not doubt the infective nature of the disease. Davidson considers that many organisms normally present in the healthy tissues are capable under favourable circumstances of giving rise to dysenteric inflammation in the bowel;

thus he says that the bacillus coli communis usually harmless, may become virulent in catarrhal conditions of the mucous membrane. Finally, he states that it is uncertain how much of tropical dysentery is caused by the amoeba dysenterica.

Manson (P), of Aberdeen, writes in 1898 that when present the amoeba is generally easy to find. While not questioning the occurrence of this parasite in dysentery, he expresses doubt as to its "exact significance in relation to the disease". This doubt he bases on the ground that in a certain proportion of well-marked cases where he searched for the parasite in the stools of dysenteric patients, he failed to meet with it, and also on the fact that in many cases where there was no reason to suspect the existence of dysentery, the same or a very similar form of the organism was frequently to be found in healthy stools.

Such then are the observations made and the conclusions come to by a few only of the large body of workers who have of recent years devoted themselves to the study of this subject. That there is much difference in the opinions at present held cannot be at all doubted, for while some observers such for example as Cunningham, Koch, Kartulis, Hlava, Dock, Kovacs, Musser, Quincke and Roos confirm and adhere to the conclusions originally arrived at by Losch, others take quite a different view. Thus Grassi, Schuberg, Gasser, Celli and Fiocca deny that the amoeba is con-

cerned in the causation of the disease, while on the other hand Chantemesse, Widal, Ziegler, Ogata, Maggiora, Arnaud, Celli and Fiocca incline to the belief that the bacterium coli commune acquiring special virulent properties acts as the cause of the trouble. Again, Osler, Councilman, Lafleur, Kruse and Pasquale believe in two kinds of amoebae being constantly associated with dysentery, the one a non-pathogenetic organism and the other the real cause of the disease. Laveran believes that different specific organisms are accountable for the varieties of the disease occurring in hot and cold countries, while Zancarol is of opinion that pyogenic streptococci are the cause of dysentery. On the other hand Calmette, Bertrand and Baucher attach much importance to the bacillus pyocyaneus as being concerned in the etiology, and Silvestri lays as much stress on a form of diplococcus as having been the principal agent responsible for the production of an epidemic which he recently investigated.

Such immense variety of opinion among those who have worked at the bacteriology of this disease up to the present day manifestly indicates the need for still more careful research, and until experimental methods are still more successfully applied, the facts regarding this subject will remain to a large extent enveloped in doubt and mystery. However, the amoebic theory as to the etiology of the disease has so far found most support and it will therefore be appropriate to give at

this stage a brief account of the organism.

Morphology of the amoeba.

Belonging to the class Rhizopoda of the Protozoa, the amoeba groups among the very simplest form of animals and consists of a unicellular mass of protoplasm. Each organism independently is capable of locomotion by means of pseudopodia which it can protrude and retract. When at rest it is spherical (appearing discoid as seen under the microscope), pale green in tint, roughly about one-hundredth of an inch in diameter; it has an outer homogeneous zone of lighter colour, the ectoplasma, and an inner granular darker zone, the entoplasma or endoplasma. The outermost portion of the creature appears under the microscope as a single thin dark line, while the endoplasma contains granules which may be either coarse or fine, as well as vacuoles that is to say clear circular or oval spaces, variable in size and number. The amoeba generally contains a nucleus placed a little to one or other side, seen better when the organism is at rest, and best when the amoeba has been subjected to certain methods of staining; the process for the staining of the nucleus is always attended with much difficulty. A nucleolus may be seen occasionally but not very easily. Frequently red blood-corpuscles and occasionally leucocytes may be observed in the body of the amoeba, but never fat-globules. The mobility of the organism accounts for the variety of forms it may assume as well as for the

power of locomotion referred to before, both being effected by means of the pseudopodia. The amoeba becomes motionless at a temperature below 75°F. or about 24°C. but unless kept below this temperature for several hours at a time it regains its motility on being raised to blood heat. According to Lafleur not only do the amoebae become motionless in dysenteric stools when these become acid in reaction, but then they entirely disappear at the end of about 24 hours after the stools have been passed. A solution containing 1 part of the Sulphate of Quinine in 5000 of water immediately stops all movements and makes the organism pale and dim.

Methods of staining.- (1) Portions of a stool in a case of dysentery may be hardened in Muller's fluid (which consists of the Bichromate of Potassium 2¼ parts, the Sulphate of Sodium 1 part, and Water 100 parts) and these may afterwards be cut and stained. (2) A thin film of the stool may be spread over one surface of a cover-glass which may be steeped in Muller's solution and subsequently stained. (3) Sections may be made of the affected tissues and these may be hardened either in Muller's fluid or in a mixture of 3 parts of that fluid and 1 part of Methylated spirit, and the preparation may ultimately be stained with methylene blue.

Finally, mention may be made here of what are known as "encysted amoebae" which have, as already observed, been met with by some observers. They are resistant forms of the organism, capable under certain circum-

stances of transmitting the disease from one person to another and of withstanding better the action of the gastric juice, a fact experimentally demonstrated by Quincke and Roos as has already been pointed out.

Chapter IV.

-PATHOLOGY AND MORBID ANATOMY-

When engaged in the discussion of the etiology of dysentery, I mentioned that in the opinion of certain authorities, such as Klein, dysentery was far from being regarded as a "single disease in etiological respects". Others, like Manson, looking upon dysentery from the clinical aspect, consider it as but a term which implies a group of symptoms indicating an inflamed condition of the colon, and not a single well-defined condition of disease. Indeed, the remarkable variety which dysentery exhibits, not only with regard to clinical symptoms, but also in relation to causation, type, associated conditions, and termination, seems almost to warrant such a view being taken. The regular course which some forms run, the tendency which others have to relapse, or to terminate in abscess of the liver, or on the other hand, to remain unassociated with hepatic trouble, have from time to time been pointed out with reference to the great

differences in the type which is assumed by the malady under various circumstances.

Such considerations as these, therefore, render the study of the pathology and morbid anatomy of dysentery one of some difficulty, for we are not always able to associate cause with effect, and in the light of our present knowledge of the subject we have to content ourselves with describing the latter and forming the best conception we can regarding the former.

The pathology of any disease refers not only to such disease, but also to the relations which it bears to other allied conditions, and it is here that the difficulty arises in connection with dysentery. Much has of recent years been done in the way of throwing light upon the causation of the troubles included in the category of this ailment, but a great deal still remains to be done in this direction before it is possible to deal in a comprehensive manner with the subject of the pathology involved. Thus it comes to be a task of no little magnitude to state in a brief sentence, and yet with sufficient fullness, exactly what is implied by the term dysentery from the purely pathological point of view. The consensus of opinion, however, at the present time is undoubtedly in favour of regarding it pathologically, to use the words of Notter and Firth, as a "specific inflammation of the inner coats of the large intestine, having a tendency to terminate in ulceration, suppuration, or

even gangrene of the affected tissues". I have already mentioned some of the forms in which the disease is accustomed to manifest itself, namely the sporadic, endemic, and epidemic forms; but taking into account the pathological and the clinical aspects of the malady, it is far more convenient and practical to classify dysentery, in the first instance, as being of the acute and the chronic variety.

Acute dysentery.

Seat of the lesion.- Pathologists, in general, agree with regard to the seat of the essential lesions which characterise this disease. The anatomical changes which occur in dysentery, for the most part, are localised in the large intestine, but in this, as in many other respects, the disease shows a remarkable degree of variation. For, although the large intestine is the most usual seat for the dysenteric lesion to occur in, yet it is by no means uncommon to find the lower portion of the ileum invaded to a greater or less extent. Further, in the case of the large intestine itself, although the local changes due to the morbid process are most frequently limited to the region of the ileo-caecal valve or its immediate neighbourhood, yet they are often found extending throughout the entire length of the large gut from ileo-caecal opening to anus. The commonest condition, however, is for the caecum and the ascending colon to constitute the locally affected area. In one series

of 18 autopsies which I made on the victims of acute dysentery, I found that in 10 cases the caecum and to a greater or less extent the ascending colon comprised the affected area, while in 6 cases the whole length of the large intestine was involved, and in 2 instances the ileum, close to the ileo-caecal valve, gave distinct evidence that the process had invaded the small intestine.

But when it comes to the question of point of origin of the anatomical changes occurring in dysentery, there is not the same general agreement among those who have studied this aspect of the disease. For, while some observers like Lyons, appear to hold that the descending colon, sigmoid flexure and rectum are the chief seats involved in the commencement of the morbid processes, others, such as Kelsch and Keiner, are of opinion that the sigmoid flexure and the rectum are the portions mainly affected in the first instance. Others again, as for example Mayne and O'Brien, state that the rectum is the principal seat, while still others, like Davidson, consider the caecum to be decidedly the starting-point, so far at least, as the "gangrenous dysentery of tropical malarious countries" is concerned. And here I may state that a connection has by some been suggested as existing between point of origin and seat of lesion on the one hand, and the particular type assumed by the disease on the other. Thus, for example, it was

observed that in the course of the outbreak in the Cumberland and Westmoreland Asylum previously referred to, the disease was of the croupo-fibrinous type, while in all cases which afforded the opportunity of being examined post-mortem, it was found that the lower portion of the ileum had been invaded by the morbid process. Again, attention has been called to the fact that in the particular type of dysentery which occurred in Ireland in connection with the famine of 1848, the anatomical changes of dysentery were most marked at the rectal end of the intestinal canal.

But not only do pathologists disagree with regard to the locality in general, in which these intestinal lesions originate, but they also differ as to the kind of tissue which affords the starting-point of the mischief. For, while some regard the solitary glands as the original seat of the changes, there are others who consider that the glandular tissue in no way is associated with the primary lesion, but that the essential structure of the mucous coat itself is the tissue involved. It is therefore evident that the whole subject of the origination of the lesion, first with regard to locality in the intestine and secondly with regard to tissue involved, requires considerable elucidation. But, whatever be the actual state of affairs in these respects, whatever be the truth as to the relation between seat of lesion and type of disease, it is at least certain that the nature of the morbid pro-

cesses involved in any case is intimately associated with the particular type of the disease which is present.

Nature of the morbid process.- The processes characteristic of acute dysentery vary according as the catarrhal conditions of the mucosa which generally usher in the changes in the bowel, pass on to assume either (1) the gangrenous or purulo-gangrenous type, the "forme gangreneuse" of French writers, or (2) the fibrinous, croupo-fibrinous or pseudo-diphtheritic type. If then, anything like a complete study is to be made of the morbid anatomy of this disease, due consideration must be paid not only to the several forms of the ailment, but also to the various stages in its course. It may, however, not be out of place to commence by making at this stage a few remarks with regard to the general condition of affairs presented for consideration to the pathologist as he proceeds to lay open the cavity of the abdomen in a subject who has died of acute dysentery.

The peritoneum.- It is not uncommon to find this serous membrane to all appearance healthy or but slightly affected; on the other hand, however, it may show the presence of various abnormal conditions. Where the peritoneum is apparently unaffected, death has, in all probability, resulted at a very early stage of the disease, and the attack has been of a mild nature. In such circumstances a careful search will frequently reveal

signs of some co-existent morbid condition which may have been the actual cause of death. It is, however, very common to find the peritoneum covered with patches of injection, and its cavity containing more or less ascitic fluid. These patches usually mark the site of the more internal lesions; they may be mere patches of congestion, or may appear as scattered areas of a dark slate-grey discolouration. In some cases parts of the peritoneal membrane are covered with lymph and the membrane shows signs of local inflammation over limited areas, but the appearances due to acute general peritonitis are not very often met with under these conditions. Adhesions between adjacent layers of peritoneum are occasionally associated with the dysenteric process, and where perforation occurs it does so usually towards the lower end of the intestinal canal. Such are the changes most often met with in the peritoneum in connection with the dysenteric process, and the particular set present in any case will, of course, depend mainly on the type of the disease and the stage of the attack in the course of which the patient succumbed.

The intestines.- In mild cases of dysentery where death has occurred during the earlier stages, the external aspect of the intestinal tube may present no abnormal appearance; the casual observer would, therefore if he contented himself with this incomplete examination be apt to miss the actual condition of things. This

brings to my recollection a case in which a young hospital assistant was making, in my presence, a post mortem examination in the Noakhali hospital (Bengal). Having found in the heart an organic lesion sufficient to account for death, and noticing nothing abnormal in the external appearance of the intestines, he was ready to state that death was due to cardiac disease and he was about entirely to overlook the intestinal condition present. As a metter of fact the patient in this case had recently contracted acute dysentery and had, at a very early stage of that disease, succumbed to the effects of mitral disease of the heart. When, however, the caecum was laid open the presence of the bowel condition could not possibly be overlooked. In cases of longer duration, even the external appearance of the intestines may be distinctly altered from the normal. Loops of intestine may occasionally be found adherent to neighbouring portions, and in a few cases evidence of perforation may be discovered.

But most important of all are the changes which occur on the inner aspect of the intestinal wall, for these comprise the essential morbid anatomy of the dysenteric process. In order to have a clear conception of these changes, the study of them must be systematised in accordance with the successive stages through which the disease passes in its course.

Catarrhal changes characterise the early stages.- Death from dysentery itself, during its earliest stages

that is, when the catarrhal changes predominate in the morbid process, is by no means very common; yet every now and again an opportunity is afforded to the pathologist for the study of the conditions characterising this early period, as for instance when the subject of the disease dies as a result of some concomitant malady. It is also possible to study these changes by observing cases in which the disease has progressed to different stages in different portions of the intestinal canal, where in some parts it has advanced so far as to produce a fatal result, whereas in others it has just commenced or is progressing in various stages of gradation. In one case, recently referred to, where I had the opportunity of noticing the changes that had occurred in connection with the early stages of dysentery, I found patches of congestion over the mucosa of the caecum with a slight thickening of these areas, the solitary glands in the vicinity were somewhat enlarged, but the agminated glands or Peyer's patches, as they are called, appeared not to be affected. The ascending colon and the hepatic flexure were mottled, the transverse colon and the splenic flexure were less so, whereas the descending colon, the sigmoid flexure and the rectum seemed unaffected except for their general congested appearance. No ulcers had developed, and no commencing ulceration could be distinguished, so that the blood, which the patient had passed for three days previous to his death, could

not be traced to this source. On making a section of the wall of the caecum and examining it microscopically it is quite possible at this stage to notice the epithelium in the process of being shed and to find the capillary vessels in the mucous coats as well as in the submucosa in a highly engorged condition. Further, the cell-elements of the solitary glands appear to be proliferated and the crypts of Lieberkuhn normal, though in all cases the surrounding capillaries are greatly distended with blood.

The gangrenous type.- When, in the subsequent stages however, the disease passes on to assume the gangrenous form, a very common condition of things in tropical dysentery, and when death occurs at the height of this stage, very marked appearances present themselves in the course of a post-mortem examination. The first points which present themselves to the observer when he opens the abdominal cavity under these circumstances, are the foul odour and the appearance of extensive discolouration within that cavity. The former is associated with an inflated condition of the intestinal tube due to the accumulation of gases which result from the putrefaction both of the walls and of the contents of the gut; the latter with a certain oedematous thickening of the intestinal walls due to a sero-purulent infiltration of their deeper layers. The discolouration in various parts may be of a reddish, livid, dusky or slate-coloured hue, and it may occur in distinct patches or may be more or less continuous throughout. The thick-

ening, which is of an irregular character, has a peculiar effect upon the inner aspect of the intestinal wall, for it produces elevations; these in the first stages of their development contain a thin sanious liquid, but later on, as the suppurative process advances, they come to contain a quantity of sero-purulent material. The result of this condition of things is to cut off the nutrition of the more superficial layers of the mucous membrane which accordingly necrose and ultimately form sloughs, gray, often bluish-green, or even black in colour. During life the sloughs frequently become detached and are passed out with the stools, leaving ulcers behind. The ulcers of dysentery vary in size and shape, but most often they are elongated and placed with their long axis across that of the gut, though small irregular and even circular ulcers are by no means infrequent. In numbers too these ulcers vary greatly in different cases, thus in mild attacks there may be just a few large ones, whereas in severe cases it is not uncommon to find the intestine covered from ileo-caecal valve to anus with innumerable ulcers having irregular margins and ragged bases, such that when the gut is removed from the abdomen, slit up longitudinally, and washed, the appearance it presents is, what might aptly be termed, moth-eaten or honeycombed.

The conditions which I have just described, were present in all their various phases in the case of one

Meakha (prisoner No. 8462 in the Barisal Jail, Bengal) who died on October 22nd, 1898. The patient, a Mahomedan male, aged 30 years, had an attack of dysentery six months previous to his admission into jail. He was admitted into the jail hospital on August 6th, 1898, for a second attack of the same disease. Under treatment he steadily improved until September 1st, 1898, on which date he showed signs of a relapse. From this time he gradually became worse, his stools increased in number and came to consist of blood mixed with purulent matter and sloughs with an extremely foul odour. In the post-mortem examination made in this case on October 22nd, 1898, I found that the peritoneum was congested and that it contained a small quantity of turbid serum; the great intestine was discoloured throughout. On slitting up the large gut, I found it full of purulent, semi-liquid foecal matter with an overwhelming fetid odour. On removing the gut from its attachments and washing it by means of flowing water, I brought into view innumerable ulcers, varying considerably in size, having irregular margins and shreddy ragged bases. Several of the ulcers extended deeply down to the peritoneal coat of the intestine but there was no evidence of perforation; on the other hand, the serous covering of the gut had formed attachments with contiguous portions of visceral peritoneum and had thus locally strengthened itself.

Not infrequently the dysenteric ulcer burrows both

deeply in the direction of the muscular coat as well as in a longitudinal direction in the submucous tissue so that long tunnels or fistulae pass from one ulcer to another. In such cases interference with the vascular supply of the superposed portions of mucous membrane causes these to slough or disintegrate. Moreover, in the gangrenous form of the disease it is not by any means uncommon to find sloughs of considerable size discharged with the stools during life and resembling a diphtheritic cast of the intestinal tube.

If a microscopic examination of the affected tissues is made at an early stage of the process, the detachment of epithelium, the infiltration with pus and blood, the absence of connective-tissue cells, and, in general, the disintegrative changes can readily be distinguished. But if, on the other hand, the investigation be made at a somewhat more advanced period of the gangrenous process, very little indeed may be made out as to the nature of the changes involved, except so far as the presence of purulent material will allow.

The fibrinous type.- In this type, which dysentery sometimes assumes, the morbid process is associated with the exudation of a lymphy or fibrinous material, and it is according to the particular manner of this exudation that some writers have subdivided this form of the disease into croupo-fibrinous, non-croupous,

and fibrinous varieties. In the first there occurs a greyish-white deposit which varies in thickness and extent and consists of an amorphous material for the most part extending into the glands and involving the adenoid tissue of the mucous membrane. In the second variety a fibrinous exudation takes place in the mucosa and no appreciable deposit occurs on the free surface; the exudation is on the summits of the rugae in the form of small brownish patches; a coagulation-necrosis takes place later on and is followed by suppuration, ulceration and sloughing. In the third variety, which is the most severe, the mucosa and submucosa are involved to the extent of the bowel becoming rigid, thickened and often narrowed in its lumen. Here an exudation of amorphous material, for the most part, takes place between the original tissue-elements, as a result of which pressure is exerted on the glandular tissue and on the connective tissue of the submucosa, owing to which gangrene often supervenes. Hence it is that this variety of dysentery is not uncommonly found associated with the gangrenous form.

Chronic dysentery.

On opening the abdomen in a case where death has occurred as the result of long-standing dysentery, it is usual to find either slight adhesions between adjacent folds of peritoneal membrane or an extensive matting together of neighbouring viscera by means of their serous covering. Externally the intestines are

frequently pale, and the walls of the tube vary in thickness and in consistency in various parts. Viewed from the internal aspect the surface may be pale or discoloured, of a reddish, livid or slaty hue. Ulcers varying in size and in number, with indurated edges, generally oval though sometimes circular, are found side by side with the cicatrices of former ulcers. The canal of the gut may be constricted here and there owing to causes which either operate from without, such as adhesions of the peritoneal surface, or produce their effects from within, as for example contraction taking place in connection with the cicatrices of old ulcers. These ulcers lie for the most part with their long axis transversely in the intestinal wall, so that when contraction does occur it usually results in the narrowing of the lumen of the tube. As a result of the constrictions thus formed in some parts of the intestine, a corresponding dilatation of the portions immediately above the seats of stricture is very liable to occur; the dilated portions are generally thinned out as compared with normal healthy intestinal wall.

Associated conditions in the pathology of dysentery.

The portion of the ileum nearest the caecum is from time to time found to be encroached upon by the essential morbid process in some of the forms of dysentery; but whether this condition be present or not, the small intestine is usually found to be hyperaemic

in acute cases, and pale in chronic cases.

The mesenteric glands are often enlarged and softened in recent cases, but as often they are indurated in long-standing cases.

When the element of malaria is associated with the dysenteric condition, the spleen is generally somewhat enlarged and frequently softer than normal.

The kidneys are sometimes congested, especially where hepatic complications are at the same time present.

The liver is frequently the seat of abscess, sometimes multiple, more often single; it is also hyperaemic, enlarged, softened, or in old cases pale and fatty. The exact relation between dysentery and single large abscess of the liver has recently been made the subject of investigation. Leahy, in a contribution to the "Lancet" in 1895 gives an account of a case from the study of which he comes to the conclusion that inasmuch as the amoeba coli was found in the pus of a liver-abscess coexisting with and following upon dysentery, the organism must have travelled from the seat of lesion in the intestine to the liver either (1) by blood-vascular channels, or (2) by lymph-channels, helped in either case by the motile power of the amoeba itself. Whether there is this direct connection between the two conditions or not, is by no means very clear, and only a very elaborate and difficult series of research can help to make this

evident. For the present, therefore, we must content ourselves with noting the occasional coexistence of the two conditions as complicating one another, observing practically the effects which the combination produces on the economy of the patient, and hoping that at no very remote period further study will throw light upon the scientific relations which these troubles mutually bear to one another.

Pneumonia not infrequently occurs as a complication of dysentery in the later stages when the vitality of the patient has been already greatly lowered by prolonged illness. Pleurisy is a somewhat less frequent complication. Occasionally it happens that an abscess forms in the base of the right lung in connection with the suppurative process in the liver.

Perforation of the intestine associated with a dysenteric ulcer has been known to take place but is of very rare occurrence. When it does come about the ordinary signs of perforation of the gut are present.

Tropical dysentery.

In the dysentery which occurs in the tropics (and here I may add that I am referring more particularly to the form of the disease so commonly met with in India), there seems to be very little doubt that the results of the morbid processes, as seen after death, vary with the type and severity of the disease. In the following remarks I propose not to include such allied

conditions as the chronic diarrhoea of India or hill diarrhoea of which an excellent description was given by Sir Joseph Fayrer as long ago as 1876.

In tropical dysentery the prominent condition is, in general, a more or less extensive inflammation of the mucous membrane of part or whole of the large intestine with a strong tendency to run into ulceration and to implicate the solitary glands. In former times when less was known regarding the exact nature of the morbid process, it used to be looked upon as a condition of simple inflammation of the mucosa of the large intestine, but the very fact that the disease was so little amenable to treatment soon suggested that this view, originally held by Raleigh, was not a correct one. Dr Parkes associates the commencement of the ulcerative process in all cases with the solitary glands. Murray makes very similar observations with regard to the solitary glands. Dr Macpherson, writing about the middle of this century, says "the appearance presented to us in simple Bengal dysentery is that of an inflammation of the large intestine, which may be diffusive, ulcerative, purulent, haemorrhagic, or gangrenous, according to circumstances". Martin, writing somewhat later, quotes his experience in the following manner. In the milder cases which yield to treatment within two or three days, he says, it may be presumed that the process of disease has not proceeded beyond a mild form of congestion or of inflammation

of the mucous surface and glands, whereas in severe cases the inflammatory condition spreads, often insidiously, deep into the intestinal coat and becomes characterised by abrasions, ulcerations and sloughs which are but varying degrees of the same morbid process. Tumidity with tenderness of the abdomen, associated with irritability of the stomach and vomiting, the liability of the peritoneum to be occasionally involved in the inflammatory changes, and the tendency of the acute disease under certain conditions to pass into the chronic state, have all been noticed in connection with this trouble.

The occurrence of hepatic mischief, and especially abscess, as a complicating condition in the dysentery of the tropics is not very common, and it is noteworthy that when such a combination does occur in one and the same case, the victim is usually a European placed under conditions of climate, mode of life and diet which appear to play an all-important part in connection with the nature of his ailments. The peculiar set of complications in question has been frequently met with in the Presidency General Hospital, Calcutta, an institution set apart for the treatment of Europeans. In a large number of cases of dysentery that from time to time came under my notice in the Barisal Jail and Hospital as well as in similar institutions populated by natives, not one case occurred with abscess of the liver as a complication, during the course of several

months. In the Millbank Prison, out of many hundred cases which took place in a period of seven years, "not one has been complicated with hepatic abscess" (Baly). Further, some observers have directed attention to the peculiar manner in which the dysenteric lesion is associated with the caecum and rectum in particular, whenever the disease is complicated with hepatic trouble. The caecum, as we have seen, is the favourite seat for the starting of the lesion in dysentery, at any rate in tropical malarious countries. The exact relationship, however, between the seat of the morbid process on the one hand, and the occurrence of hepatic complications on the other, has not yet been quite well made out. With regard to the rectum being specially implicated where liver conditions coexist with dysentery it has been suggested, first, that congestion or enlargement of the liver interferes with the circulation in the haemorrhoidal veins and gives rise to haemorrhoids, and, secondly, that owing to this and to the loss of tone resulting in the rectum from adhesions and inflammations, this portion of the tube comes to be a receptacle for the lodgment of vitiated matters. In a case with hepatic complications the liver is found to be congested, inflamed, suppurated or indurated, according to the severity of the type and the duration of the disease.

Where the scorbutic complication existed during life, the appearances post-mortem are of the nature

of disease of all the "body-fluids". Much disintegration of the large intestine is present, the lumen of the tube being filled with shreds and sloughs of mucous membrane as well as with dark grumous blood. The liver is either comparatively firm and filled with dark watery blood, or, if much haemorrhage has occurred from the bowels, the organ is found to be soft and bloodless. The spleen is soft, disintegrated and filled with dark thick blood. The heart and lungs are generally congested with diseased blood and softened in their texture. On the skin ecchymosed patches are frequently found.

Such are the appearances after death in the special class of cases referred to. Where death takes place in a severe case of true tropical dysentery uncomplicated with any allied trouble, the vessels of the abdomen are in a more or less congested state according as the patient during lifetime was full-blooded or the opposite and according as to whether he passed a small or a large quantity of blood by the bowels during his illness. Moreover, the viscera are found to be adherent to one another by means of their serous coats, either to a slight degree or to the extent of considerable matting together. The glands of the mesocolon and mesentery are sometimes enlarged. Thickening of the coats of the large intestine, softening, ulceration, and sloughing of the mucous membrane of the whole or of part of the large intestine and not in-

frequently also of the lower portion of the ileum, are conditions of very common occurrence. Perforation of the intestinal wall, though it has occasionally been observed, is certainly of rare occurrence under these circumstances. Besides these conditions, the discolouration often extensive, the presence of an extremely fetid odour, the existence of the characteristic ulcers and of other circumstances referred to in connection with the morbid anatomy of dysentery in general, are all to be found in making an autopsy where death has resulted from this formidable disease of the tropics.

Chapter V.

THE CLINICAL ASPECT OF DYSENTERY.

I. SYMPTOMATOLOGY.

Acute dysentery.- Notwithstanding the degree of variation that exists among individual cases, there are certain common features which pervade the disease as a whole, such for instance as the irregular course, the tendency on the part of the ailment to become chronic, and the manner in which there sometimes occurs an intermission and sometimes an exacerbation of the diarrhoea. Cases of the most acute form often prove very rapidly fatal, but in other cases it is usual for one or more of these symptoms to predominate at some stage of the illness. The very varied manner in which these characteristic features are combined in different cases gives rise to the numerous clinical forms which have been recognised and in which the disease is to be met with in practice.

Dysentery commences either gradually or suddenly, but in the vast majority of cases the onset is preceded

by a prodromal period in the course of which there occurs sometimes a bilious diarrhoea without any marked febrile reaction, and at other times a form of gastric derangement together with a slight rise of temperature. It is less common for dysentery to follow upon a period of constipation.

A. Simple dysentery.- In the less serious forms of dysentery, unassociated with any gangrenous change, it is usual for the trouble to commence with an attack of diarrhoea accompanied with some loss of appetite and general malaise. This condition of things continues for a day or two after which the stools become more frequent and also undergo some change in character, there is a feeling of uneasiness about the abdomen, griping sets in, accompanies the motions and comes to be associated with considerable straining. The stools, which at a very early stage are often merely loose or unformed, now come to contain mucus and streaks of blood. As the disease progresses the griping pains assume a very severe twisting character and constitute the condition known as tormina, while the straining or tenesmus becomes exceedingly distressing and often indeed painful. The straining is associated with a constant desire to empty the bowels, it is not relieved by the passing of a stool, and it often results in the expulsion of merely a small quantity of mucus tinged with blood or of a small blood-streaked scybalous mass. Where circumstances favour the advance of the disease,

the blood and mucus, which at first only tinged the stools, now begin to increase in quantity and in fact to comprise the bulk of the stools; the anus becomes inflamed and undergoes spasmodic contractions as the result of burning pains, while later still, relaxation of the sphincter and prolapsus ani frequently come about. The bladder becomes reflexly affected, and difficulty and pain are experienced during micturition. The ingestion of food provokes a desire on the part of the patient to go to stool and the discomfort connected with this makes him instinctively avoid taking more food than is absolutely necessary, so that owing partly to this and partly to the loss of appetite, the total quantity of food consumed is very small. I have said that in some cases there occurs a slight rise of temperature; this febrile reaction is usually slight except where malarial complications are present, and in these cases a temperature of 103°F. or even higher has often been registered. I shall, at a later period, when dealing with the malarious form of dysentery, have more to say upon this subject, illustrating my remarks with a short history and the temperature chart of a typical case. Vomiting frequently constitutes quite an urgent symptom, especially in the earlier stages of the disease, the vomited matter consisting for the most part of bile mixed with gastric juice and undigested food. As the disease continues, the pulse becomes weak and rapid and the tongue greatly coated. The urine becomes

scanty, contains no albumin in ordinary cases and only a very small amount in severe cases, and chlorides are usually diminished in quantity or altogether wanting. In this connection I have to mention that in the case of nine prisoners who, amongst several others, were in the Barisal prison-hospital suffering from dysentery, I found a marked increase in the quantity of chlorides present in the urine. This condition was not present in a single other case which occurred either previous to, during, or subsequent to that time. The urine in all cases was carefully examined by me each day before the early-morning meal was served out to the hospital prisoners, and it is a curious fact that in the case of these nine prisoners alone whose regime in no way differed from that of their companions in hospital the urine showed markedly the presence of chlorides throughout the severe periods of their illness. In none of the cases referred to did any urates, albumin or sugar exist, there was no cloudiness or deposit, the reaction was distinctly acid in each instance, and the colour of the urine varied within normal limits. I may add that the test applied for the detection of chlorides was the usual test consisting of nitric acid to prevent a precipitation of the phosphates, and then a few drops of a solution of silver nitrate. The specific gravity in six out of the nine cases was somewhat low (regarding 1015 to 1025 as the average limits for the specific gravity of normal urine) and in the other three cases

it was certainly not high. The following is a list of the cases together with the specific gravity of the urine corresponding to each case.

Name of patient.	Specific gravity of urine.
1. Gobindo Tarua	1010
2. Osman	1012
3. Ahmed Ali	1011
4. Amir Hossain	1006
5. Easin Kazi	1020
6. Komor Ali	1018
7. Jon Ullah	1011
8. Aroj Ali	1014
9. Fedoo Ali	1022

(Urine examined on Decr. 13th, 1898 and following days)

With regard to the stools in dysentery, these vary greatly in number. From 10 to 50 motions in the 24 hours may be looked upon as very ordinary in a case of dysentery, whereas in severe cases 100 or more may occur in the course of the day. In the early stages of the disease the stools resemble those of simple diarrhoea, but very soon after they come to be streaked with blood and mucus. At all times the odour from these discharges is extremely offensive. In the later stages the characteristic stool of dysentery consists of a serous, bloody discharge in which float debris and fleshy-looking lumps which French writers have graphically termed "lambeaux charnus", "lavure de chair" or "raclure de boyaux". The fluid part of the discharge is highly albuminous, and

it has been calculated that in a case of medium severity the daily loss of albumin from the system by this channel amounts to something between 772 and 926 grains. This, together with the greatly diminished ingestion of food, amply accounts for the rapid emaciation and increasing debility of the patient. Davidson is of opinion that when the disease is confined chiefly to the caecum and ascending colon, as is often the case in the tropical variety, the stools are more abundant, more faeculent and less frequent. The motions are preceded by griping pains and passed with but little straining; they are thin, pale and frothy, mixed with blood and mucus, and are tinged bright yellow in some parts, green in others. He adds that in such cases the right iliac region becomes the seat of swelling, uneasiness and of pain, especially on pressure, also that fever, nausea and depression are accompanying conditions.

B. Gangrenous dysentery.- When, however, the disease assumes the gangrenous form, the symptoms, both constitutional and local, assume a far more serious character. The manner in which the constitution reacts to the morbid processes at work is seen in the greater debility, the rapid weak pulse, the dry brown tongue, and the very scanty urine. Later, the temperature falls below the normal, there is great emaciation, the patient is unable to turn in bed, there is a tendency to the formation of bed-sores, the sphincter ani becomes relaxed, and the passing of stools comes to be quite beyond the

control of the patient; a distressing hiccup sets in towards the end but consciousness is retained throughout. The stools in this variety of dysentery are of a dark chocolate colour, they contain pus, sloughs of the mucous and submucous coats as well as streaks of blood, and they have an odour which is overwhelming in its offensiveness. Such a description applies to a typical case of severe gangrenous dysentery. If, however, circumstances favour the patient's return to health, the strength gradually increases, the stools improve in character and their numbers decrease, while the tongue loses its dry brown appearance, the urine comes to be more abundant and the appetite slowly returns.

In the case of Meakha, prisoner No.8462, previously referred to, it will be seen from the charts given below that in the course of a serious illness of eleven weeks, at the end of which time the patient succumbed, the number of motions per day was never very large and indeed never exceeded twelve in the course of the 24 hours. The temperature was never above 101.5°F., the diminution in the quantity of urine passed in the day was considerable, especially towards the latter end of the illness, and the pulse which became weak as the disease progressed, also came to be rapid as compared with the normal. The illness in the case under consideration extended from August 6th, 1898, to October 22nd, 1898.

Name Meakha. I. Age 50 yrs.
Disease Dysentery Result Died

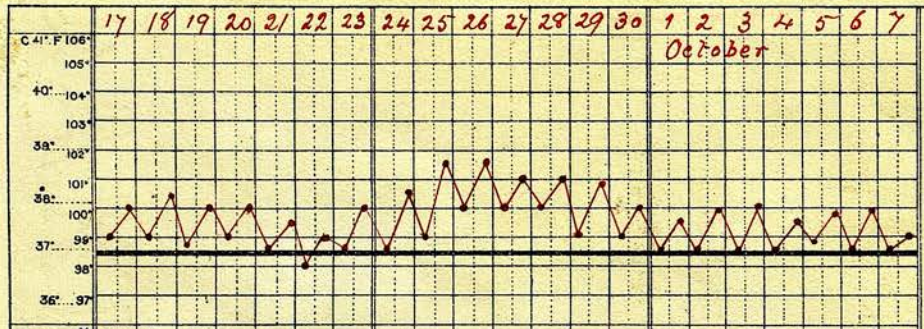
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
C 41°. F 106°	August																				
105°																					
40°...104°																					
103°																					
39°...102°																					
101°																					
38°...100°																					
99°																					
37°... 98°																					
97°																					
36°... 96°																					
Pulse. M	80	78	80	82	90	86	76	76	78	76	80	82	76	76	72	76	80	76	70	72	70
E																					
Resp. M	22	20	22	22	24	22	20	20	20	20	20	20	18	20	16	18	18	16	16	16	16
E																					
Motions.	12	10	7	8	6	5	4	4	4	5	4	4	4	4	3	5	2	5	3	2	2
Urine, ozs.	50	40	40	38	30	40	46	48	50	51	48	52	49	50	50	51	49	51	53	49	52
Sp. Gr.	1022																				
Reaction.	Acid.																				
Chlorides	Absent																				
Albumen.	Absent																				
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Name Meakha. II. Age 50 yrs.
Disease Dysentery Result Died

	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C 41°. F 106°						September															
105°																					
40°...104°																					
103°																					
39°...102°																					
101°																					
38°...100°																					
99°																					
37°... 98°																					
97°																					
36°... 96°																					
Pulse. M	70	76	72	70	70	72	76	80	76	72	76	78	80	76	80	84	86	78	76	80	80
E																					
Resp. M	18	20	18	16	16	20	20	22	20	18	18	18	20	16	20	20	22	20	20	22	22
E																					
Motions.	3	2	2	4	3	1	2	2	3	2	4	1	1	1	2	2	2	2	1	4	1
Urine, ozs.	50	49	48	50	46	52	50	48	47	50	46	52	50	52	40	39	39	36	40	35	40
Sp. Gr.																					
Reaction.																					
Chlorides																					
Albumen.																					
Day of Dis.	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

Name Meakha. III. Age 30 yrs.

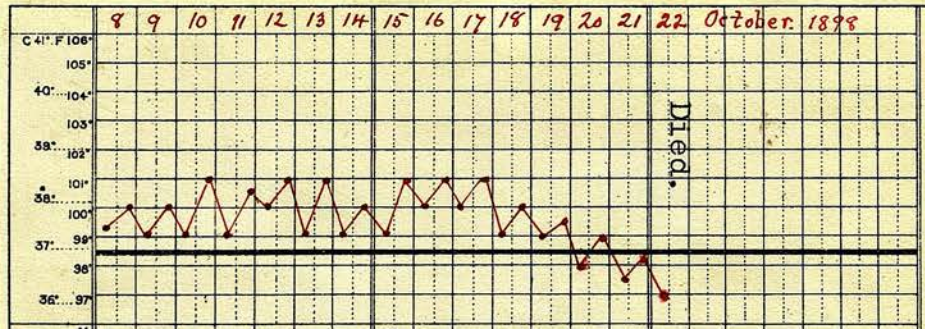
Disease Dysentery Result Died.



	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1 October	2	3	4	5	6	7
Pulse. M	76	72	74	74	70	74	76	76	80	84	90	86	90	88	80	86	90	86	80	86	80
E																					
Resp. M	16	16	18	18	18	18	18	16	20	20	18	20	22	24	20	22	24	22	22	20	22
E																					
Motions.	2	2	4	4	2	2	3	4	4	3	3	3	3	2	2	3	3	3	3	3	3
Urine, ozs.	40	40	42	40	38	38	40	36	30	30	28	28	30	28	30	32	30	32	35	28	28
Sp. Gr.																					
Reaction.																					
Chlorides																					
Albumen.																					
Day of Dis.	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63

Name Meakha. IV. Age 30 yrs.

Disease Dysentery Result



	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 October 1898						
Pulse. M	86	90	92	90	90	94	86	90	92	92	92	90	90	85	80						
E																					
Resp. M	20	22	22	18	20	22	20	20	24	24	22	24	20	20	20						
E																					
Motions.	2	3	3	3	3	3	3	3	3	3	3	3	3	5	4						
Urine, ozs.	29	30	25	25	20	25	23	20	26	20	22	26	20	20	22						
Sp. Gr.																					
Reaction.																					
Chlorides																					
Albumen.																					
Day of Dis.	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78						

Died.

In general, the number of stools passed is directly proportional to the severity of the disease, but this is not invariably the case. The character of the motions, the presence or absence of complications, and the constitution of the patient are quite as important, if not more so, than the mere number of the stools. Thus, in the case which I have just described, the motions were certainly not numerous for a severe case of dysentery, but they were of the worst kind, consisting of mucus, blood and gangrenous sloughs with a very marked putrid odour. In other cases, where the condition of the patient appeared to be most alarming as far as numbers of motions were concerned, I have seen recovery take place in the most admirable manner. I will briefly mention the facts connected with just one instance of the latter kind of case.

Ambica Churn Das, Hindu male prisoner, aged 35 yrs. complained to me on October 14th, 1898, of griping pains in the abdomen, looseness of the bowels and inability to work. A year previously he had suffered from dysentery, but since then he had been quite free from the trouble. The patient was fairly robust and had been "put on medium labour". On hearing his complaint, I had him isolated and kept in a solitary cell under observation. During the first four hours he passed as many as 20 stools. He was then transferred to the dysentery ward of the prison-hospital and confined to bed. Within the first 24 hours he passed 56 motions

which varied in quantity and contained both blood and mucus. The odour from them was nauseating but not nearly so offensive as in the case previously described. There was some colic, some tenesmus, no distinct rise of temperature, the pulse-rate was very slightly above the normal, and for the huge number of motions passed the prostration was not very great. The patient was at once put on suitable diet and under treatment with Ipecachuana and Opium. This course appeared to check the disease in its acuteness, but the number of stools still remained very large. On October 19th, 1898, I made a change in the medicinal treatment and prescribed Bael and Ispaghool (or Isuphgool, as it is frequently called) to be prepared and administered in a manner which I shall describe in a subsequent page. On the following morning the record showed a distinct reduction in the number of stools passed in the preceding 24 hours; this process of decrease steadily continued until on October 26th, the patient passed two stools and on the 27th only one. From this time onwards to the 30th, Ambica's register recorded daily either one or two motions which were tinged neither with blood nor with mucus but were of a bright yellow colour and semisolid consistency. At this stage the patient was discharged from hospital to the "convalescent gang" where he was kept on special diet and without labour until his recovery was complete. Such cases are not infrequent, and from their uncomplicated nature and

the unbroken course they run towards recovery, they have suggested to writers on the subject the name of "simple dysentery" as differing from the gangrenous and other forms. A study of the cases of Meakha and Ambica Churn Das, the clinical histories of which I have placed side by side, will help to contrast the two forms of the disease of which the cases are quite typical.

Chronic dysentery.- Instances are to be met with where the frequent recurrence of diarrhoea gives rise to dysenteric processes, but it is more usual for the chronic form of the disease to follow upon an acute attack which has to all appearance passed off and ended in recovery. But however brought about, the condition is a curious one as to the symptoms it produces. For, sometimes the patient is constipated, at others he passes healthy stools, and at other times he suffers from a diarrhoea combined with colic which results in loose motions, more or less streaked with blood and mucus. This condition of things, if it persists long enough, tells sooner or later on the general health of the patient, the appetite becomes affected and the digestion impaired. When cicatricial contraction occurs in the intestine and produces a narrowing of the lumen in some part and a corresponding dilatation above, tumidity and tenderness of the abdomen result, flatulent eructations occur and a feeling of distension comes about after meals. Unless the

condition is checked at this stage, the patient becomes greatly debilitated, the pulse comes to be very weak, and death may eventually occur as the result of exhaustion.

Other forms of dysentery.- The desire on the part of clinicians to classify dysentery beyond the great division into acute and chronic, has resulted in the adoption of several names, each being intended to signify a form in which some particular symptom or set of symptoms constitutes the leading feature of the trouble. It is very convenient and indeed essential that the most common clinical forms should be named and described, but it must always be kept in mind that in its general characters the disease is the same throughout, the points of difference coming in only here and there in the course of the clinical history.

a. In the benign form the symptoms are very distinct and mild. The stools, which seldom exceed 10 to 15 a day, are rarely found to contain mucus or blood at the first onset; they are at this stage of a greyish white colour, the "dysenterie blanche" of French physicians. A little later the stools become streaked with blood, but in about a week or a fortnight the morbid phenomena abate and a return takes place to the normal. In this form no constitutional symptoms of any severity are to be noticed.

b. In the malarious form the great feature is a

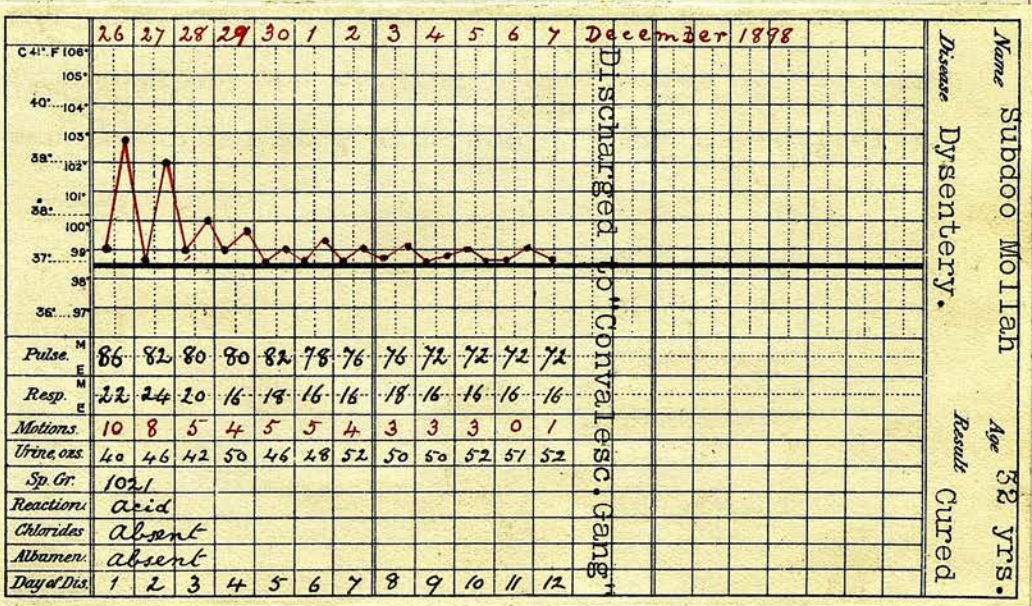
febrile reaction which, of course, is more or less intense according to the degree of malarial infection. In slight cases a rise of temperature to the extent of 1^{o} or 2^{o}F. may be noticed every evening, but in severe cases of this form of the disease the symptoms may be greatly aggravated and intense prostration may result with a marked tendency for the body to become cold. This algidity, which characterises the malarial element in the disorder, has, as a clinical feature, attracted the attention of continental authors to an extent that has led them to distinguish a special form of the disease under the name of "dysenterie algide". One writer, Delioux de Savignac, mentions a certain association which, in his opinion, exists between the morbid processes involved in this variety of dysentery and those of cholera. There is probably no doubt that these two conditions can exist in the same individual so that their symptoms become blended together, yet it is none the less true that algidity can exist in dysentery without the above complication. In fact the symptom is somewhat constant in the graver cases and very often helps in establishing a prognosis.

The association of dysentery with malaria is so intimate that Trousseau was led to ascribe the same etiology to both conditions.

With regard to the febrile reaction in these malarious cases, I may remark that instances have frequently come under my notice where the whole force of the

fever element has confined itself to the onset and the first few days of the intestinal trouble. The temperature, while it lasted, showed a regular evening rise, reaching 102° or 103°F., and in the morning falling to the normal level. The eventual disappearance of this pyrectic condition is frequently associated with a marked improvement in the bowel-complaint and thus it would appear that the removal by the bowels of a large amount of noxious material from the system is in some way responsible for the abatement of the constitutional reaction.

The following is the case of Subdoo Mollah, prisoner No.8844 of Barisal prison, a Mahomedan male aged 32 years, who had suffered from dysentery on one occasion six months previous to his incarceration, that is about the middle of the year 1898. The case is one in point and illustrates what I have just said regarding the temperature in relation to the dysenteric process for which the patient was confined in the prison-hospital from November 11th to December 7th, 1898. A glance at



the chart will suffice to show the points referred to. (The morning and evening temperatures in all cases were recorded at 9 A.M. and 4 P.M. respectively).

c. Scorbutic dysentery is clinically characterised by the history of the case and the presence of the scorbutic symptoms. The discharges by the bowels consist of a mixture of mucus, blood and sloughing shreddy masses floating in large quantities of watery fluid. The onset in this form is frequently insidious and the advance of the disease is attended with danger.

d. Rheumatic or Arthritic dysentery is the name given to a form of the disease which attacks by preference those who have a rheumatic constitution, inherited or acquired. It is not of very frequent occurrence, and though troublesome it is not dangerous. Stoll says that the rheumatic form of dysentery is characterised by the production of articular disease which supervenes generally in the course or during the decline of the malady and more often in slight than in severe form. The rheumatic condition often attacks a single joint, showing a decided predilection for the knees, but it sometimes manifests itself in the various joints in succession. The complication is not as a rule attended with much fever or pain, and though it may last for a considerable length of time in some cases yet it passes on to recovery without producing organic mischief, as for example of the heart, in the way that ordinary acute rheumatism is wont to do.

e. Inflammatory dysentery is a term which has been applied by some, especially French physicians, to cases in which a rise of temperature occurs to a greater or less extent as the result of concomitant gastric derangement. This name or rather that of "phlegmonous dysentery" has, by Annesley, Cambay, and others, been given to cases where suppuration occurs in the submucous region of the intestinal walls. Side by side with this febrile reaction of the system there occur two general symptoms, namely feebleness and prostration. When nervous phenomena, such as sleeplessness, and low muttering delirium, occur together with increased prostation, a weak rapid pulse and a dark tongue, the indication is that septic absorption is taking place. To this particular form of the trouble the name of septic or pyaemic dysentery has been applied. The patient under these conditions frequently succumbs as the result of absorption of noxious matters from the intestine,- a kind of autointoxication.

f. Haemorrhagic dysentery.- In the dysentery of European countries it is not usual for the stools to be composed almost entirely of blood, but in tropical regions such stools are not only more common, they are also frequently accompanied by conditions like epistaxis and purpura. This variety of dysentery has been distinguished as haemorrhagic from the nature of the symptoms.

g. Dysentery associated with hepatic disorder.- It

is usual in all but the mildest cases of dysentery as it occurs in the tropics for some complication of the liver to co-exist. Acute hyperaemia and congestion of the liver are the rule in this disease; these conditions in a few instances precede, but in the vast majority of cases manifest themselves during the course of the intestinal trouble. The special signs and symptoms connected with the complication vary from a mere feeling of weight in the right hypochondriac region to one of acute pain; there is dullness on percussion, the liver is frequently enlarged, the digestion is more or less deranged, nausea and vomiting often occur and a slight rise of temperature sometimes takes place. When an abscess of the liver forms the symptoms become very marked, for a considerable rise of temperature takes place preceded by rigors and accompanied by local tenderness and pain, at first of a dull and heavy nature but afterwards acute. The temperature often reaches 103^{o} or 105^{o}F. When there is compression of the portal vein ascites is the result, and when the large bile-ducts are pressed upon jaundice supervenes; the movement of the ribs in respiration is impeded and there is a short dry cough. As the abscess continues to develop the constitutional symptoms become pronounced, the tongue gets dry and furred, and vomiting may be of frequent occurrence. As regards the manner in which this complication comes about there is some variety of opinion, for while some hold that the liver affection

shows the occurrence of portal infection from dysenteric ulceration, others are of opinion that the two conditions are entirely independent of one another. But whatever may be the actual connection between them, the point at present under consideration is that the occurrence of the hepatic mischief during the course of the intestinal trouble is characterised by a set of symptoms which render the diagnosis of the real condition of things a matter of comparative ease and certainty. Considering, for one thing, the exceedingly wide distribution of dysentery in the tropics it seems very probable that most, if not all, cases of tropical abscess of the liver owe their origin to infection at some time or other from dysenteric ulceration. It does not seem sufficient for those who refute this suggestion to state in argument either that cases of hepatic abscess occur without any symptoms of dysentery, or that fatal cases of such abscess have occurred without any trace of dysentery having been discovered post mortem. For, it is quite conceivable that an insidious disease, such as dysentery sometimes is, may occur even to the extent of allowing septic infection of the portal system from the intestine without at the same time manifesting symptoms sufficient to attract the patient's attention. Further, it is also possible that in some cases the intestinal lesion is so small that though it permits of the infection taking place, yet it heals up so thoroughly afterwards as not to permit of any trace

of the dysenteric process being discovered post mortem. Davidson says "when the liver complication arises during the course of a dysentery, we are justified in referring it to the action of poisonous materials formed in the intestinal canal and carried to the liver by the portal vein".

What is known as the bilious form of dysentery is closely associated with hepatic disorder though of a less serious nature than suppuration. The complication is characterised by a bilious diarrhoea, by vomiting sometimes of a serious nature, and by a sub-icteric discolouration of the conjunctivae and of the skin. Fever generally occurs accompanied by headache and restlessness.

h. Dysentery is frequently associated with typhus and typhoid fevers all of which occur as diseases of war and famine. The lesions in these various maladies are, however, sufficiently distinct to prevent any confusion.

Further complications and sequelae.- Besides the articular affections, the serous effusions, the acute congestion and abscess of the liver, there are diverse other conditions of importance which from time to time complicate the disease we are considering.

Local peritonitis, limited to the surface corresponding to the seat of internal ulceration, is by no means rare. It manifests itself in the form of exudations, sometimes profuse, whose occurrence has been

regarded by Colin as the point of departure of the pains felt during the malady. This partial peritonitis is not very formidable. It is infinitely more rare for general acute peritonitis to occur as a result of intestinal perforation. The fact that perforation of the gut so seldom occurs notwithstanding that ulcerative action is so constant in the dysenteric process, though somewhat remarkable, is quite easily explained; for, exudations of a protective nature are poured out with the greatest facility on the serous surface of the intestines and these give rise to adhesions which strengthen the parts.

Parotitis has sometimes been noticed to occur in the course of a dysentery. It has a tendency to end in suppuration.

Thrombosis of different vessels has been observed. Thus, Cambay mentions the complication as occurring in the external iliac artery and giving rise to gangrene in the corresponding limb, while Laveran notes its occurrence in the femoral veins and also in the venous sinuses of the brain.

Paralysis, sometimes affecting the motor and sometimes the sensory nerves, has been described by Laveran and many others. Attacks of this nature are frequently transient; occasionally they produce fatal results. Paralytic conditions of the bladder and of the sphincter ani are among the more common.

An abscess of the base of the right lung has been

mentioned as an occasional complication in connection with the suppuration in the liver.

II. DIAGNOSIS.

In general, dysentery is not difficult to recognise, at any rate so long as the symptoms are well marked.

The possibility of confusion between dysentery and colic saturnine (a condition universally admitted to be due to lead-poisoning) is conceivable though far from likely. In acute lead-poisoning the constipation, the cramps in the legs, giddiness, torpor, coma and convulsions, as well as the severe abdominal colic together with the history of the case, will guide the physician in forming his opinion. On the other hand, in chronic poisoning with lead, such symptoms as anaemia, the presence of a dark blue line on the gums at the base of the teeth due to the precipitation of the sulphide of lead, frequently the occurrence of chronic inflammation of the kidneys and the presence of gout, and above all, the condition of wrist-drop brought about by a paralysis of the extensor muscles of the hand, will leave little room for doubt as to the exact nature of the case.

Internal haemorrhoids, besides giving rise to a bloody discharge, may also bring about tenesmus with the expulsion of mucus. A rectal exploration, however, will permit of a ready means of distinguishing between the two conditions.

Colité puerperale and dysenterie des accouchées are names that have been devised respectively by the French physicians Laroyenne and Vinay in order to designate a set of cases in which tenesmus occurs along with the discharge of bloody mucus a few days after confinement. This usually relieves the afflux of blood which makes its way towards the rectum as a result of the constipation and of the interference with circulation due to the pressure of the foetus.

Cholera is readily distinguished by the character of the discharges, from the algid form of dysentery.

Tubercular entero-colitis too is readily differentiated from dysentery by the general, pulmonary and other symptoms present in the former.

The chronic diarrhoea of Cochin China has been confounded ~~with dysentery~~ to such an extent with dysentery that many authors have been inclined to regard the two as one and the same disease. The great distinction, however, is that in all these Oriental forms of diarrhoea the stools are a frothy, copious, liquid discharge either greenish or yellow, acid in reaction and usually free from blood, whereas in dysentery though the consistency and colour of the stools may be similar, yet the reaction is neutral or alkaline and blood is generally present. In the chronic diarrhoea referred to the tenesmus and straining are either very slight or absent, whereas in dysentery they are very well marked. In such cases, however, a diagnosis should not be too

hastily formed, at any rate not before a period of observation. In the chronic diarrhoea and hill diarrhoea of India, diseases that may under certain circumstances be quite easily mistaken for dysentery, the leading feature is functional derangement of the liver as marked by the diminished secretion and decreased out-put of bile and consequently the white or clay-coloured stools. These troubles, moreover, are of insidious origin and are frequently associated with a malarial cachexia.

In general, the diagnosis of dysentery will depend upon a careful consideration of the symptoms coupled with the history of the case and of the mode of onset of the attack. Besides paying due regard to these points, the physician should, before making up his mind as to the real nature of the case, inspect the stools and carefully examine the abdomen of the patient.

III. PROGNOSIS.

The prognosis must, of course, vary according to many circumstances depending upon the conditions of the individual patient. Thus, it will depend on the resistance that can be offered by the subject, on the nature of the lesion, the causes and duration of the attack, and upon the rapidity and manner in which therapeutic intervention is resorted to. The character of the attack has an important bearing upon the probable result of the case, for the greater the number of the motions passed and the more blood lost, the greater

will be the drain upon the system and the less favourable the prognosis. Moreover, the presence of serious complications, such as gangrenous processes in the intestine, abscess of the liver and similar conditions, render the prognosis grave. The increase of debility, coldness of the body, a rapid thready pulse, and the occurrence of hiccup are signs that generally precede a fatal termination of the disease.

It is, however, most essential under all conditions to be very guarded in giving a prognosis in any particular case of dysentery, for the disease is an exceedingly treacherous one. Occasionally a case of which the physician has despaired one evening has rallied in the course of twelve hours and come to have a most hopeful outlook on the following morning. Vice versa, it happens quite as often that a patient apparently progressing in a most satisfactory manner has, in the course of a single night, become much worse and died as the result of some internal mischief which gave no evidence of its presence during life but which came to be manifest only on post mortem examination. Again, an acute attack is very liable to pass into the chronic disease under circumstances that favour this transition; there is also a great liability to the occurrence of relapses as the result of exposure to cold or of indiscretions in diet, more especially in those who have been rendered feeble by the excessive indulgence in alcohol.

The mortality in dysentery varies greatly not only in different countries but also in the same country as a consequence of many conditions some of which are very little understood. In an epidemic which occurred in some parts of France in 1857, the disease was fatal in 20 per cent of the cases. In Algeria many years ago the mortality from dysentery used to be 50 per cent, but this high rate has since greatly decreased. Numerous figures have been quoted in the earlier chapters to show the variable, and in many localities high death-rate which unfortunately is to the present day recorded from this disease.

Chapter VI.

TREATMENT OF DYSENTERY.

1. Prophylactic treatment.- If the disease which we have been considering at such length from its various points of view, has anything of the wide distribution which it is said to have, if it possesses to any degree the serious nature ascribed to it in some of its numerous forms, if it produces, especially in certain regions of the globe, a rate of mortality at all as high as it is reported to do,- how great must be the importance of the question of prevention? This matter involves a deep problem whose solution depends upon the practical application of methods the knowledge of which has been obtained from the scientific study of the entire subject. The prevention of the disease before it appears, on the one hand, and its successful management when it does occur, on the other, are after all what humanity at large desire and what the physician in particular aims at. The means which we have practically at our command for preventing the

occurrence of dysentery are simply the outcome of the knowledge we possess regarding the etiology of the disease. If, as there is very little doubt, the malady is to a large extent an infective one, depending upon the action of a specific organism, it stands to reason that the spread of an epidemic outbreak can be greatly checked by the adoption of proper prophylactic measures. If the life history of the amoeba outside the human body were known, if the sources of infection were better recognised and more definitely under control, the prevention of the disease could, of course, be effected to a much larger extent and with far greater certainty. Notwithstanding, however, the deficiency of our knowledge in this respect, there are certain very effective measures which we are able to put into force as we have been taught by experience and by the most elementary facts connected with the causation and nature of the disease. Thus, the value of prompt and thorough disinfection of every apartment which has been occupied by a dysenteric patient, of all articles of clothing, of bedding, and in short, of everything that has had the slightest chance of contamination, is now universally recognised. In the carrying out of these precautions it is not always possible to adopt the elaborate methods which the advances of modern science would dictate, and the reasons for this are quite manifest. Thus it is not every hospital or every town that is provided with a Washington Lyon apparatus for the disinfection of bed-

ding and clothing by means of steam. In such cases recourse must be had to the use of antiseptic agents, the most commonly employed being those of a chemical nature, such as solutions of Carbolic acid or one of the numerous preparations of phenol now so largely in use, strong solutions of lime, a solution of Chinosol in water of the strength of 1 in 1000, etc. In effecting the disinfection of these articles we are guided by a knowledge of the fact that the amoeba of dysentery has not the great vitality which many other pathogenic organisms have, for comparatively feeble antiseptic agents suffice in rapidly and completely destroying the parasite. Special attention should, of course, be directed to the disinfection of all bed-pans, commodes, enema tubes and other apparatus which have been in contact with the foecal dejections, and finally of the stools themselves. Trousseau, Fayrer, Maclean and others have drawn particular attention to the infectious nature of the disease and to the risk attending the retention of dysenteric stools in the wards of an hospital. In a large institution like the Barisal prison in Bengal where dysentery prevailed to an enormous extent, the following were the plans which I had in force in the absence of any elaborate forms of appliance. All articles of bed and personal clothing were subjected to prolonged boiling in a cauldron used exclusively for this purpose; pillows and mattresses were subjected to the powerful disinfectant action of

dry Sulphurous acid gas obtained by burning sulphur in a small closed room, they were then placed in the direct rays of a tropical sun for several days together, and finally they were treated to a spray of weak Carbolic lotion in sufficient quantity to wet merely the surface. Enema tubes were soaked in a solution of Carbolic acid of the strength of 1 in 20 and metallic instruments were treated in the same manner after being boiled. The pans used for receiving the discharges of the patient consisted of glazed earthenware vessels which, considering the large numbers required for use, had the advantage of being very cheap. The vessels were first coated with liquid tar, then put into use for a few days during which time they were repeatedly coated over in the same manner, and finally they were destroyed. Each pan was used only once a day and contained a small quantity of cinders mixed with dry phenyle powder. Immediately after a vessel had been used its contents were destroyed by complete incineration and the pan was subjected to intense heat, then allowed to cool and finally coated over again. Lastly, the wards occupied by the dysenteric patients were frequently lime-washed, the lower portions being tarred to a height well above the level of the beds, and constant fumigation was employed with a mixture of frankincense and powdered sulphur, the former acting as a deodoriser and the latter chiefly as a disinfectant.

In localities where the slightest suspicion exists

with regard to the purity of the water-supply, all water used for drinking purposes should be carefully boiled and preferably also filtered before use. The regime as regards the dietary, chiefly in places where dysentery is known to be endemic, requires to be made the object of the most careful scrutiny. It need hardly be stated that all unwholesome or indigestible articles of food,- in short, anything that might, by acting as an irritant, set up a condition of diarrhoea,- should be strictly avoided. If diarrhoea has set in, its cause should if possible be traced and removed and the condition itself promptly attended to in a suitable manner. In addition, care must be taken at all times and more especially at nights to avoid chills which are usually due to sudden changes of temperature or exposures from a hot to a cold atmosphere. It is also necessary that clothing suitable to climate, season of the year and to individual constitution should be worn. The region of the body which of all others requires special care in this respect, is the abdomen, and the wearing of flannel next the skin has been recommended as the best method of carrying out this precaution. The matter is one of great importance and chiefly so in connection with European residents in countries like India which in warmth of climate are unsuited to their constitutions, where the mode of life and kind of food are so different to what they have been accustomed to, and where, at the same time,

dysentery prevails in all its forms. A short account of a case which occurred recently within my experience will serve to bring out these points in a somewhat striking manner. A well built young man, an Englishman, A.H., an official in the employ of a firm of merchants, happened to be travelling by the Assam-Bengal Railway. It was a very warm day in early summer, 1898, and A.H. revelled in his cool white clothes. In the afternoon about sunset he arrived at a little wayside station at a time when I happened to be in the neighbourhood. Having reached his temporary destination and while still very much heated and not a little fatigued after the journey, this young man hastened to plunge into a cold bath. He said that he felt very much refreshed immediately after and that he then partook of a liberal repast consisting of dough cakes and curried meat which had been prepared for him at the dak-bungalow (resting house). Not many hours afterwards I received an urgent message to say that a "sahib," who had arrived at the bungalow and had suddenly taken very ill, wished to see me as soon as was possible. He had, as I shortly afterwards discovered, come in for colic pains and diarrhoea which very soon developed into a severe form of dysentery with its painful symptoms of straining and tenesmus and its alarming blood-stained motions. A long journey during part of which, on the preceding day, he had been exposed to the direct rays of the sun, the fatigue, unsuitable attire, and, above all, the

imprudent sudden exposure to cold combined to lower greatly the vitality and to bring about an attack of dysentery from which the malarial element was not absent. I have known a similar case to occur as the result of exposure combined with excessive indulgence in alcohol. The patient in this instance was a middle aged man, an European resident in Calcutta, who, after partaking rather freely in the merriments connected with a dance, had sought the cool outside air to refresh himself attired as he was in the summer costume suitable to the occasion. The result was that in the course of the next 48 hours he was suffering from a smart attack of dysentery; in this case the liberal indulgence in alcohol on the night of the sudden exposure helped greatly to aggravate the trouble induced. Such cases are typical of the kind of thing the practitioner has constantly to do with in India and even the brief history which I have given of these cases will serve to bring out the importance of the points in relation to prophylaxis which I have recently been considering and which I desired to emphasise.

So far we have dealt with the prevention of the disease as it is apt to occur under ordinary circumstances, and it now remains that we should consider the possibility of the disease appearing under circumstances connected with large concourses of people in one place. It is of course a matter of the highest importance in the prophylaxis of dysentery that the

closest surveillance should be placed over all arrangements in connection with such assemblages, examples of which are to be found in encampments for troops, emigration depôts, emigrant vessels and large fairs. It is greatly to be desired that where possible selection should be made of locality and a suitable site chosen; besides, it is important to secure a wholesome and sufficient water-supply, to provide against pollution of this water-supply, and to establish proper arrangements for the disposal of refuse and excrementitious matter. The pollution of water and of soil is a source of considerable danger and its prevention a measure of the utmost importance. To secure against the possibility of this contamination and method of spread, the following precautions will be found necessary. The condition of latrines should be constantly supervised; all foecal matter should be thoroughly disinfected and then either buried deeply far from human habitations or possible sources of water-supply, or preferably burnt; further, where practicable, the position of the camp should be shifted from time to time. The adoption of such measures has frequently prevented the occurrence of dysentery in epidemic form under circumstances like those detailed above where, in addition, sporadic cases have made their appearance.

Such are the main considerations involved in the study of the prevention of the disease. I may here lay special stress upon the timely checking of attacks of

diarrhoea and relieving of constipation, conditions which not only frequently precede but are also directly conducive to the development of the more serious form of bowel-complaint.

2. Hygienic treatment.- At this period in the history of medicine it scarcely needs to be argued that the treatment of dysentery on hygienic principles, now so universally recognised, is a matter of the highest value in the management of these cases. Indeed, in many of the less severe cases proper attention to the hygienic surroundings and to the diet of the patient alone has sufficed to bring about a favourable result within a comparatively short period. Rest in bed is as essential in the treatment of dysentery as in that of any other serious inflammatory condition, and if with rest of the entire system and especially of the inflamed parts we could effect the removal of the cause of irritation, the system of treatment would be an ideal one and recovery alone would ensue. But, like most other ideals, this combination of circumstances in the treatment is impossible to secure owing to the inaccessibility of the affected surface. Short of this however, we can by means of the application of rest bring about many conditions which are desirable and conducive to recovery. Rest in bed allows better of the application of warmth and it also permits of recuperative action in the system in a manner sufficient to compensate to some extent for the drain upon the

patient's strength. Plenty of cubic space should be allowed and fresh air and direct sunlight admitted into the apartments or ward occupied by dysenteric patients; further, a constant temperature should be kept up in the atmosphere within. The air must not, of course, be admitted in the form of a draught or current circulating over or near the bed of a patient; it ought rather to be allowed to stream in at an equable rate and in such a manner as to renew the air in the apartment with the least possible disturbance. It is always desirable to have a floor well raised above the surrounding ground-level, a precaution which should receive special attention in damp and malarious localities. In connection with the administration reports of some of the district jails in Bengal of which I had charge, I had occasion to point out defects in the construction which rendered not only many of the work-sheds but also the dysentery ward itself damp. The general soil of Bengal is clay, with a considerable proportion of silicious sand, fertilised by various salts and by decayed substances, animal and vegetable; this clayey soil, owing to its compact and adhesive nature, retains much moisture. The presence of this dampness in the soil has a marked influence upon the prevalence of dysentery and an important bearing upon the treatment as might be noticed throughout Lower Bengal. I observed that in prisons the disease occurred more among the prisoners who were employed in such occupa-

tions as the puddling of clay for brick-making, excavating or gardening than among those occupied in cane work or in carpet-making. Moreover, the seizures were generally more severe when they occurred under any of the former set of conditions, and the attacks lasted longer when the cases were treated in the damp ward referred to, barely 3 feet above the level of the ground, than when treatment was carried out in wards on a higher level and therefore more dry. Personal cleanliness is another essential in the proper treatment of dysentery. In a very mild case the patient will generally find it more convenient to go to the water-closet for the purpose of passing his stools, but in all other cases the bed-pan should be employed although in the beginning some difficulty may be felt by the patient in the use of this article. The stools should in all cases be dealt with in the manner already indicated, and where they are required to be kept for inspection by the medical attendant they should be retained in suitable places and with special precautions. The physician will do well to issue definite instructions on this subject especially and he should also contrive to visit his cases at sufficiently frequent and suitable intervals so that it is never necessary to retain a dysenteric motion for too long a time. Good nursing adds very greatly to the comforts of the patient and goes far to aid in his recovery. Reference has already been made to the manner in which bedding,

clothing, vessels and other articles used by the patient are to be dealt with, and these methods should be very carefully carried out according to the directions of the physician. Isolation, where possible, is always desirable, if not as a matter of necessity, at any rate as an extra precaution which cannot but diminish the risks of spread, and which, generally speaking, has no disadvantage connected with it. In the case of hospitals, prisons and camps it is usually quite a simple matter to find the extra accomodation and to effect the isolation, but there are two conditions under which I have experienced difficulty in carrying out any such plan of treatment. The first is where dysentery occurs in sporadic cases on board an emigrant vessel and where, of course, it is necessary to adopt every measure against the disease assuming the epidemic type. There occurred a few cases on board the S.S."Pongola"in her journey with emigrants from Calcutta to Natal in the course of which I found it impossible to effect anything like complete isolation in the limited space placed at my disposal. The other instance of the difficulty I have referred to occurs constantly where the physician practising in India has to deal with the caste prejudices of the orthodox Hindu or the bigoted Mahomedan, among whom European methods of treatment are still little appreciated and by whom the slightest suggestion of isolation would be resented and looked upon with suspicion

as an omen foreboding some evil. Overcrowding should, as far as possible, be prevented, but whenever large numbers of people must needs live even for a time within a limited area, as in the case of emigrant vessels, the greatest vigilance must be exercised over the sanitary arrangements. The question of change of air is also one of considerable importance in the hygienic treatment of dysentery, although it is only a somewhat limited class of people who are able to avail themselves of so luxurious a form of treatment. There can however be no doubt that, where available, a sea-trip in suitable waters is most highly beneficial in some of the most intractable forms of the disease. I recollect a case in which a young woman of five and twenty years, shortly after her first confinement, came in for an attack of acute dysentery in the treatment of which every ordinary resource was exhausted without avail. The condition of the woman became so bad that her life was almost despaired of, and further owing to her ill-health the child suffered somewhat. The patient, what with the recent troubles connected with child-bearing, and what with the severe drain upon her constitution brought on by the bowel-complaint, rapidly became emaciated, and to add to the troubles much difficulty was experienced in the matter of diet. It however occurred to the physician in charge of the case to recommend a sea voyage and although the patient was very weak, still it was arranged that she should

have the benefit of this suggestion. The sixth week after her confinement in Calcutta, therefore, saw the patient on board a steamer bound for Penang and Singapore. On the journey she had every attention in the way of good nursing and medical attendance and improvement was noticed to commence even in the course of the short voyage. The patient made a stay of four months in Singapore and were I at liberty to exhibit in this place photographs of this woman which I was fortunate enough to secure and which were taken shortly before and a little time after her sojourn abroad, I could do more than pages of description to convey to the mind of the reader the immense benefit derived from the change. No special form of medicinal treatment was applied during the stay abroad and the management of the case during that interval was based entirely upon dietetic and hygienic principles. Sea-baths were recommended and indulged in during the period of convalescence with great benefit. The case illustrates very well the advantages that are in some instances to be derived from these plans of treatment, namely a combination of the hygienic and the dietetic, but, as I have said before, the unfortunate thing is that it is not always possible to put some of the methods into practice. The hygienic form of treatment for dysentery is then simple enough in principle, though in practice it is not always an easy matter to secure for your patient a properly lighted and ventilated

apartment as a sick-room, or to make sure that the methods of disinfection recommended are adequately carried out, or again that the warmth and proper nursing of the patient are duly attended to. The principles of so important a method must however be kept in mind while the application of the details must in many instances depend entirely upon existing circumstances.

3. Dietetic treatment.- The importance of the matter of diet in dysentery cannot be exaggerated nor will it fail to be realised at once when we consider that it is the alimentary canal itself which is affected. The aim here again is to give the inflamed area as much rest as is possible, thus Manson says "were it possible, it would be well to stop all food". Since, however, this plan is not possible, our next object must be to secure for the patient a form of diet which, while it nourishes him and supports his strength, at the same time throws the minimum amount of work upon his digestive system, in other words, we must decide upon a form of food which has a large nutritive value but a small foecal residue. In these respects milk is generally regarded as the best form of diet for a dysenteric patient and in the large majority of cases it is correct treatment to practically restrict the patient to a simple milk diet. The carrying out of this precept is not always an easy matter, for in the case of a patient who has been accustomed to a particular kind of food during health the hardship

due to any such privation may be too great to be borne with comfort. For instance, the native of Bengal is so habituated to rice as a daily article of diet that the hardship associated with the removal of this article from his diet-table is to him very nearly unbearable; so much so is this the case that in jails a severe form of punishment upon Bengali prisoners for a breach of jail discipline consists in depriving them of rice for some days together. Such peculiarities must indeed be taken into account by the physician in his treatment of disease and yet he must be careful as to how he departs from the usual milk diet or indulges his patient in other forms of food. Moreover, when any such departure is made from the general rule it must be in a suitable direction. Thus, in most cases it would be a fatal policy in the dieting of a rigid Hindu, who has been accustomed throughout life to vegetables and fish only, to administer even a light chicken soup or any form of fleshy food. The plan I used to follow with such patients was to allow them, when they got over the acute stage of their illness, a small quantity of fine rice, (usually 1 chittak or 2 ounces in the 24 hours, to begin with), boiled so thoroughly as to be reduced to a soft pulpy consistence, the starch water being poured off and not boiled in. I had opportunity to try this plan in many cases of dysentery both in hospitals and in jails, and in no case when given at the stage and in the manner which

I have indicated did it appear to do the slightest harm; in fact, in some instances, an improvement in the condition of the patient was noticeable shortly after his intense craving had thus been satisfied. The whole point is that the requirements and feelings of the sufferer should receive due consideration, and while we lay down the law that solid foods should be excluded from the dietary of a patient having dysentery we must be prepared to see when a slight and cautious digression will aid in the progress of the recovery. The milk used must in all cases be fresh, but I used moreover to find that in general in dysentery, especially as it occurred in jails, the use of boiled milk was attended with distinct advantage, the milk being allowed, of course, to cool before being drunk. My faith in the use of boiled milk is not the result of having frequently met with impure samples of milk, for it was especially in connection with prisons that I found the use of boiled milk to be advantageous, and each such institution had on the premises a dairy exclusively for the use of the prisoners and under the most rigid supervision. Whether the benefit is due to any alteration in the digestible property of milk as the result of coagulation of the serum-albumin or the destruction of ferments caused by the boiling, or whether the good effect is due to bacteriological reasons it is not an easy matter to determine. It is, however, well known that the Bacillus Coli Communis frequently

has its habitat in the milk obtained even from the best dairies, and we have already seen that this motile bacillus with many active properties is believed by several authorities to be etiologically associated with the disease in question. Now, it is quite conceivable that the destruction of this organism by the process of boiling is in some way connected with the safety I attribute to the use of boiled milk. Nor is there any disadvantage in thus treating the milk except that it acquires a peculiar what is sometimes spoken of as "boiled" taste, one which is unpleasant to some people only because they have been accustomed to the taste of unboiled milk. However, to return to the subject of the dietetic treatment, I may say that having secured a pure milk, let this supply the main article of diet in cases of dysentery. It may be given in its pure state, but whenever it is noticed that the digestion is not strong enough to cope even with this form of food and that undigested curds are being passed in the stools, the milk will require to be given diluted with lime water or to be first partially peptonised. In all cases food should be administered in small quantities at frequent intervals. If these precautions are taken it will very seldom be found that milk is not well borne by the patient; but where such is the case and it is noticed that whether after dilution or after peptonisation, the milk given is not well borne, we must turn our attention towards the substituting of some other form of

food better adapted to the particular case in question. In dealing with people who have during health been accustomed to a fleshy diet, I have found that a light broth made out of a young chicken and given to the patient in small quantities at a time, serves to sustain the patient remarkably well. Other liquid preparations of meat, such as beef juice or jugged soup of beef, are constantly used by many practitioners, but I have always had a distinct preference for light chicken soups in dysentery. In many cases, especially where the weakness and prostration are considerable, the administration of a little brandy of good quality will be found very beneficial. Some have recommended the use of wines under these circumstances, but perhaps small and well regulated doses of brandy are preferable, given either diluted with water and just before food,or together with the milk or soup. In dealing with a certain set of cases,(in India with that of the strict Mahomedan), this form of treatment with an alcoholic stimulant will sometimes be resented,and in such instances various devices may have to be resorted to in order to disguise the odour and the taste of the brandy in the food. Where, however, the case under treatment is one of a person who has not been accustomed to a fleshy diet, it is better if possible to have recourse to some simple farinaceous form of food. Sago boiled with water until each grain has thoroughly softened and dissolved, makes a very good

form of food for a dysenteric patient, and I have obtained some excellent results by restricting the diet in the acute stages, not only of dysentery but also of diarrhoea, to boiled sago and sugar, with or without the addition of milk. In special cases, when the acuteness of the condition was past, I have occasionally modified the diet, but only under the guidance of indications derived from the particular habits and constitution of the patients. Where great thirst is present, whey may be given as a drink. In some prisons in Bengal I have for the same purpose employed on a large scale with advantage the starch water collected from the cauldrons of boiled rice and allowed to cool; the protective action of the starch is probably of value. Barley water is also useful in this way owing to its nutritive and demulcent properties. In all cases the tongue must be an important guide to the physician in the matter of prescribing a suitable diet, but the condition of the stools is of the very greatest importance and requires always to be taken into account. Generally speaking, if the tongue is coated, the indication is that gastric catarrh is present and in a case like this it is better to keep the patient on small quantities of light chicken soup or diluted egg-albumin; but where the tongue is clean the diet should be composed largely of milk, given either pure or diluted according to circumstances. Thus a great deal in the matter of the proper dietetic treatment of dys-

entery rests upon the judgment of the physician. For instance, although the dietetic value of milk in the treatment of this disease has been recognised and fully confirmed by the experience of very many, yet it could certainly never be considered good practice to adhere entirely and rigidly to this form of diet regardless of all circumstances. Indeed, cases frequently occur where a supply of fresh milk is not obtainable, as on board a vessel at sea; under these conditions I have found it preferable to use fresh tinned milk rather than the frozen milk carried now a days by many ships. Except in scorbutic cases, I have found a diet made up of tinned milk, barley water, sugar, and sometimes thin chicken soups, answers very well for a brief period. In cases where symptoms of scurvy coexist, it is advisable to use fresh milk whenever obtainable. When the case of dysentery progresses towards recovery as seen especially from the condition of the patient's tongue and of his stools, changes may gradually be made in the diet-table, but this must be done only with the greatest caution, for the tendency to the occurrence of relapse in this disease is considerable. Putting it generally, one may say that when the stools come to be free from blood and mucus and to be of firm consistence, the diet may be slightly modified in the direction of increasing the allowance, to commence with, of farinaceous solid food. If, on the other hand, the restrictions on the diet are too quickly or suddenly

removed, the diarrhoea will be certain to reappear and to pass on again to dysentery. It is for this reason that the medical attendant must carefully look into the nature of the foecal discharges daily for some time after the patient has apparently recovered, and it is for the same reason that the return to anything like the normal diet must be effected only by very gradual steps. Further, it occasionally happens, that after a severe and prolonged attack of the trouble in question, it becomes necessary that the patient has to deny himself several articles of food of an irritating nature for a very considerable time after recovery. I have known a case in which a female patient several years after she had ceased to have the slightest return of her original dysenteric attack, was still unable to eat even a teaspoonful of raspberry jam without causing a return characteristic of her old complaint. Moreover, the experienced and careful physician will never omit to enquire into the origin and nature of the case with which he is dealing, with a view to determine whether any complications are present, and if so, what their nature is and what effect they must have upon his dietetic as well as his other methods of treatment. Thus, in scorbutic forms of the trouble the indication for fresh milk and fresh fruit juices, whenever these are procurable, must not be overlooked; indeed, one may go further and say that in such cases it is the dietetic treatment which is the most important.

4. Sero-therapeutic treatment.- There is no evidence yet of any great advance having been made in the serum treatment of dysentery, but the Japan Mail reports (vide the "Lancet", October 21st, 1899) that Dr Kitasato has conclusively established the efficiency of his method of inoculation in the treatment of dysentery. As the result of 50 or 60 cases only one terminated fatally. Inoculation must be resorted to speedily after the symptoms of dysentery set in. This is the only notice we have regarding an attempt to work at the serum treatment of dysentery, and it is quite conceivable that after a course of experimental work in the hands of an eminent bacteriologist a successful method may be established at some future date. The course of work necessary to carry out such an undertaking must naturally be difficult and tedious, but it is to be hoped that more light will soon be thrown upon the subject and that other experimentalists will follow in the line of Kitasato and aim at developing a method of treatment which may hereafter prove even more useful than any at present at our command. Time and material are, however, essential, and this must be kept in mind although the whole scientific world await with eagerness the results of Kitasato's further experiments. Ample are the opportunities which present themselves to the investigator in the field of medical practice in India, and much glory as well as the gratitude of suffering humanity will be the reward of success.

5. Therapeutic treatment.- That no one drug will answer in all kinds of dysentery or in all stages of the disease is a teaching which has been confirmed by long experience. Indeed, far from one medicinal agent serving any such useful purpose, the vast numbers that have been employed at various times and under various conditions, with greater or less success, render it almost impossible to give anything like a complete review of the subject in the limited space which I have at my disposal in a work of this nature. That some of these remedies have served a more useful purpose, as curative agents, than others, and have therefore become the favourite methods in the treatment of the malady, it is only reasonable to expect. But the variety of opinion which anyone is confronted with who seeks to look into the enormous amount of literature on the subject, is evidence in itself that while progress is on foot with regard to the better management of dysentery by means of medicinal agents, we are still far from having arrived at any method upon which we can with safety fall back in our treatment. And it is only in connection with therapeutic methods that this great difference of opinion exists. No one at the present time doubts that plenty of sunlight and fresh air aids in the recovery, or that overcrowding is detrimental to it; again, it is universally allowed that milk is the staple food in dysentery, and that, under special circumstances, a slight and cautious departure from the

rule regarding this kind of diet may indeed help in the bettering of the patient's condition. But when we come to the great question of the medicinal treatment of our complaint what conflicting opinions we are confronted with. For while some observers, like Clouston, tell us that ipecacuanha, administered in a variety of ways in the course of a large outbreak, proved of no avail, others like Davidson recommend its use in large doses, while still others like Latham Mayne and Niemeyer, write concerning mercurial remedies in terms of the highest praise. The very fact, however, that pharmaceutic agents, so very different from one another in their nature, have all been found to do good in the same complaint, appears to afford ground for the belief held by Klein, Davidson and others, that more than one morbid condition is included under the name of dysentery. If such is really the case how hopeless must be the task of formulating anything like a general rule for the management of all dysentery by means of one or more medicinal agents. No, this is not possible, for the disease has no remedy which the consensus of medical opinion has been able to term specific; and so very numerous are the drugs that have, alone or in combination, been tried, that I propose to select only a few of those in more common use and to consider in the next few pages their respective values in the treatment. In this connection it is necessary to supplement our own experience with that of many others.

Ipecacuanha. (Cephaelis ipecacuanha).

In British practice generally the basis of the treatment of dysentery is still comprised in the words which Sir William Gull many years ago gave utterance to, namely, "rest, warmth, and ipecacuanha". Now, there can be no doubt as to the value of this drug in the large majority of cases of the disease, according to the testimony of many practitioners who have from time to time employed it with success. It is a remedy which was first introduced into Europe from Brazil by Piso in 1658; later it was made the subject of experiment by Adrien Helvetius in Paris and was long known as the "radix anti-dysenterica"; its use was revived 200 years later (1858) by Mr E. Scott Docker to whom along with Sir John Pringle and other physicians is due the introduction of the drug into practice in this country, its colonies and hot countries generally. An active root, composed of emetine an insoluble crystalline alkaloid, ipecacuanhic acid or cephaelic acid a glucoside, starch, gum, etc., ipecacuanha is by Mitchell Bruce said, moreover, to possess "the power of arresting the inflammatory action in the bowel, checking the liquid and bloody evacuations, and often effecting a complete cure". The same observer mentions that a remarkable tolerance of the drug is readily established in many persons suffering from dysentery. And yet it has been found by Clouston to fail entirely in the outbreak of croupo-fibrinous dysentery with which he

had to deal some years ago and in the course of which he administered the remedy in doses varying from 10 to 60 grains, alone or in combination with opium, by the mouth or per rectum. It failed also in some forms of malarious dysentery in Mauritius, and in the disease as it occurred in the Millbank Penitentiary in 1823-24 (Davidson). But these are instances merely of the dictum already laid down, that is that no one drug will serve in all forms or all cases of the disease. A great deal rests with the manner in which the substance is administered, the point in this connection being that if given in doses that are too small it may fail to produce the desired effect on the bowel condition, and if given in sufficiently large doses it may be found difficult to retain. Its use therefore requires to be according to a plan which will make the chance of emesis as small as possible. In most cases, and especially where it is discovered that a period of constipation preceded the onset of the dysenteric symptoms, it is well to commence by administering a mild saline or other purgative. Sulphate of sodium will be found very suitable for the purpose, and it may be given in a dose varying in quantity from 2 to 8 drachms; calomel, in a dose of 3 or 4 grains made into a pill, has also been recommended. No food should be given some three hours before the treatment with ipecacuanha is to commence, and at the end of this period some 15 to 20 or 30 drops of the tincture of opium are to be administered to the

patient with a little water, while a mustard plaster is applied over the epigastric region. The patient during the whole of this period is kept lying on the flat of his back in bed and when, at the end of 20 minutes or so, it is observed that he is passing under the influence of the opium, a dose consisting of 20, 30 or even 60 grains of ipecacuanha, according to the nature of the case, should be administered; it may be given in the form of either pill, capsules or in suspension in water. Everything must be done to favour the retention of the drug, thus absolute quiet should be enjoined while the patient should be instructed to resist, as far as possible, all inclination to vomit. He must be told not to swallow the saliva that accumulates in the mouth, on the other hand he must lie in bed at perfect rest and without food until all feeling of nausea completely subsides. This will require from 1 to 3 hours after which period very small quantities of suitable food may be given at short intervals during the remainder of the day. On the following day this form of treatment may, if necessary, be resorted to, and usually it will be found that one or two such administrations will suffice to remove the acute symptoms of the disease. This, in general, may be said to be the plan which has to be adopted in the treatment of dysentery by means of a remedy which in life-saving power rivals, according to some, quinine, chloroform, antiseptics and vaccination.

Thus, Woodhull, in recording his experience of the treatment of dysentery with large non-emetic doses of the drug, says that he first quietens the stomach, which should be empty, with opium. He then gives a large dose of ipecacuanha (25 to 30 grains) keeping the patient in the recumbent posture and enjoining strict abstinence from food and drink for at least four hours. This dose, he says may be repeated in from 2 to 6 hours. Woodhull believes that when the stomach is empty the medicine acts non-emetically in direct proportion to the severity of the attack.

Ewart, writing on the treatment of dysentery, says "Ipecacuanha is a non-spoliative antiphlogistic, a certain cholagogue and unirritating purgative, a powerful sudorific, and a harmless sedative to the heart and muscular fibres of the intestines". He goes on to state that he has found the drug efficacious in the congestive, exudative and ulcerative stages of acute dysentery. He discusses the relative virtues of small doses frequently given and of large doses given less often, and he arrives at the conclusion that the former method results in greater depression in the long run and places the remedy "at a great disadvantage". While he prefers to use large doses (20 to 60 grains) by the mouth, he at the same time recognises the wisdom of modifying this plan of treatment in certain cases, namely, (1) where extreme irritability of the stomach is present with asthenia under which circum-

stances small enemata with 1 or 2 drachms of ipecacuanha are more valuable, and (2) where much sloughing and gangrene are present and death is very apt to result from shock and asthenia and where stimulants and opiates are indicated. He differs from those who, like Fayrer, favour the occurrence ~~the~~ of emesis, and he rather tends to encourage the retention of the drug and the absorption of its active principles. With regard to the direct manner in which ipecacuanha acts in dysentery, Ewart sums up his opinions in the following list, (1) it acts directly and locally as a slight irritant upon the peripheral nerves of the mucous membrane of the stomach, (2) it increases the aqueous character of the secretion of the salivary glands and in general the secretion of all the glands along the alimentary tract, (3) it augments the flow of healthy and unirritating bile, produces a comforting laxative action, relieves local congestion and portal plethora, and soothes the diseased parts, (4) it diminishes the force and frequency of the pulse by lowering vascular tension, and (5) it promotes general diaphoresis.

Sir Joseph Fayrer, in stating his experience, says that dysentery is a disease very amenable to treatment if it be dealt with in the very outset. He advocates a plan which in no important detail differs from those we have already considered. Rest in bed in the recumbent posture, hot fomentations or turpentine stupes on the abdomen when there is pain or tenderness felt in

that region, and above all a dose of 20 or 30 grains of ipecacuanha powder according to age, strength, etc., are the essentials of his method of treatment. No food or drink is allowed to the patient for several hours except small pieces of ice to allay the thirst which is often intense. He repeats the dose of ipecacuanha in four or six hours. According to Fayrer, as the result of this method of treatment, tormina and tenesmus diminish, the motions become faeculent and assume a peculiar yellow appearance.

Dr Hart, of the French Hospital, Suez, explains the therapeutical value of this drug in dysentery in the following manner. He says that it acts in a twofold way, (1) as a muscular sedative and (2) as a secretory stimulant. He quotes Woodward and Hilton Fagge in his support when he says that in the disease increased peristalsis of the lower colon and of the rectum occurs, and that the very frequent desire to go to stool is due to the irritability of the intestinal muscles; hence, he says, the value of the action of ipecacuanha as a muscular sedative, for a large dose quite suddenly stops the tenesmus and subsequent doses prevent its return. Further, Hart says that when the muscular coat returns to normal, the other coats lose their irritability, the inflammation subsides and then the mucous membrane passes into a suitable condition for the second property of the drug to come into play. He is of opinion that at this stage we have to deal with an enteritis,

and hence ipecacuanha acts just as in the case of bronchitis. The stimulation of the mucous membrane with the secretion of mucus is due to a direct action on the peripheral ends of the gland nerves or minute ganglia (Whitla). Further, Hart adds, that ipecacuanha strongly stimulates the liver and this is of use in dysentery where the hepatic functions are in abeyance and bile is absent from the stools.

Buchanan, who has had much experience especially in the dysentery of Indian jails, distinguishes between mild, acute and chronic forms of the disease. He believes the acute form to be a specific disease probably due to a microbe. He has great faith in the treatment of this form with ipecacuanha in large doses, and believes that when given in 3 to 5-grain doses in pill form it is of no use and can succeed only in mild cases where it is not required. His plan in the acute cases is to give a dose of castor oil on the previous night, then on the following morning to administer twenty drops of the tincture of opium, followed in 15 or 20 minutes by 25 to 30 grains of ipecacuanha powder in some form.

Maclean says that where ipecacuanha fails in dysentery "it is because it has been given too late, when structural changes incompatible with life have taken place in the affected intestine or from structural diseases of the spleen, liver, and kidneys, or the combined ravages of the malarial and scorbutic cachexias".

Warburton Begbie says "the proportion of the dose and

the frequency of its repetition must depend on the acuteness of the symptoms".

The late Professor Rutherford, of Edinburgh, established the cholagogue action of ipecacuanha experimentally on dogs. He writes "ipecacuanha is a powerful hepatic stimulant. It increases slightly the secretion of the intestinal mucus, but has no other apparent stimulant effect upon the intestine. The bile secreted under the influence of ipecacuanha has the normal composition."

Trousseau, in attributing to ipecacuanha the properties of an emetic, evacuant and irritant, says that it possesses moreover a specific action, namely that of a substitutive. He compares its effects with those of tartar emetic and says that the latter fails comparatively because it produces a violent action.

Ipecacuanha in modified and combined forms.-

Since ever the ipecacuanha practice was established in dysentery and as soon as it was seen that the drug in itself had some inconveniences, if not disadvantages, such as the property of a powerful emetic, the skill and ingenuity of physicians have constantly been employed in attempting to devise more suitable forms of the drug or methods for its administration. Thus, it has been tried in small doses, with what result we have been informed in the words of Buchanan. It has been modified in composition by the removal of the "emetine" in order that it may be retained after

its administration. To Dr Harris, of Simla (N.India) is due the credit of this attempt to remove one of the serious objections about ipecacuanha, namely the exceedingly nauseating property which anyone who has tried the drug in its usual forms cannot have omitted to notice. In an interesting paper on the subject Harris tells us how Messrs Symes and Co. of Simla worked out his idea, first abstracting the ipecacuanhic acid and subsequently remixing it with the powder after the emetine had been removed. To the modified form of the substance were given the names of "de-emetinised ipecacuanha" and "ipecacuanha sine emetina" to signify the nature of the change to which the powdered root had been subjected. Since it was recommended first by Harris it has been tried in several places but according to the testimony of Prof. Notter the altered form of the remedy has been found to be practically of inferior value. Davidson thinks that it is probably owing to the varying composition of this substance that the estimates of its therapeutic value have been conflicting and he is of opinion that its employment should be deferred until a wider experience determines its value.

With regard to the use of the remedy in small quantities, it may be mentioned that more than half a century ago Twining, when he administered ipecacuanha, did so in doses of 4 to 8 grains, alternating with the occasional use of large doses of the compound powder of jalap, a method which was found to be unsatisfactory.

Parkes not long afterwards found benefit in the use of large doses, varying from 30 grains to 1 drachm, while the drachm doses of the compound jalap powder came to be much discarded, at any rate in Indian practice. Since those times practically the use of the drug in large doses has come to be the favourite method of employing it. Exceptions are, however, not wanting for in cases where, owing to delay in treatment or to any neglect, either the stage of congestive exudation persists or that of ulceration has begun, continued small doses (4 or 5 grains) of the drug, alone or in combination with other drugs, may be found to benefit very much.

As regards the combination forms they are numerous and frequently, moreover, serviceable. When the tormina is very distressing and the calls to stool numerous, 10 to 20 drops of the tincture of opium may with advantage be added to each bolus of ipecacuanha powder. Again where the tormina is associated with excessive nervous sensibility, small doses of the powder may be given in the following form,

R

Pilul. Hydrarg.	gr.iv
Opii	gr.i
Pulv. Ipecac.	gr.ii

Sig. One pill every 3 to 8 hours according to the nature of the case.

Or the Pulv. Ipecac. Co. with or without the blue pill may be given with benefit for the same purpose. From 10 to 12 grains of the Dover's powder thus ad-

ministered will remove pain, give sleep and help in the restoration of the bowels to natural action.

The effect of ipecacuanha together with bismuth, with or without the addition of opium, has been tested on a large scale by King in India. He has administered the combination in very many cases, by the mouth and by the rectum. Whenever he found that the substance was not well borne by the stomach, he adopted the following plan. He first washed out the bowel by means of luke warm water for several reasons, (1) to overcome spasm beforehand, (2) to cleanse the gut and ensure contact of the drugs with a clean mucous surface, and (3) to stimulate the soothing process by fomentation. After this he administered an enema which in the case of the adult consisted of 40 grains of the subnitrate of bismuth, ʒss of the tincture of opium and 40 grains of powdered ipecacuanha. He has found this of great advantage in checking the dysenteric process, and similarly he has used with advantage an injection of bismuth and opium to soothe the bowel after an injection of the nitrate of silver. King, however, regards all these methods as subsidiary to the use of ipecacuanha by the mouth wherever this is practicable. In the dysentery and diarrhoea connected with famine in India he found bismuth (10 to 20 grains) given with Dover's powder to be the only reliable treatment; in these cases the intestines being free of food, the combination acted both by soothing and protecting the mucous membrane and by

allaying spasm of the sphincter ani.

Dujardin-Beaumetz believes in combining an aperient cholagogue action with that of the ipecacuanha, for he is of opinion that a cure will be effected if the action of the liver, which is in abeyance, can be re-excited and the antiseptic action of the bile brought to bear upon the putrefactive changes going on in the intestine. In using the ipecacuanha one method which he recommends consists in putting ½ to 1 drachm of the powdered drug into a six-ounce bottle, adding ʒiii of cold water, shaking up and administering the contents in half-ounce doses.

Maclean, whom I have quoted before, in administering the drug follows the usual plan of first giving a dose of opium (10 drops of Battley's solution) and after half an hour following up the treatment with 25 or 30 grains of the powdered ipecacuanha in as little fluid as possible. He advises that small pellets of ice be sucked to prevent vomiting, that a second dose of 12 to 15 grains be given after 8 or 10 hours, and also that the remedy be continued, if necessary, for some days in diminishing doses.

Cunningham follows the same plan but uses a larger dose of the drug, from 60 to 90 grains, with the result that much nausea and vomiting occur, followed by reduction of the pulse-rate, cessation of pain and tenesmus, and quieting of the bowels. He says that after this the patient passes a soft fluid stool free

from blood and mucus.

Personally I have had many opportunities of using ipecacuanha, both alone and in combination with other substances, in cases of dysentery which occurred under a variety of circumstances and which required to be treated under somewhat different conditions in practice. Now, while my experience bears out, in general, the observations which have already been made by others in regard to the value of this remedy, there are certain points which I would fain draw attention to here. There is a set of cases in which, notwithstanding every precaution that it is at all possible to take in the way of previously emptying the stomach and intestines, or of lessening the sensibility of the stomach with opium, or of keeping the patient at absolute rest and without food, it is found that a first, a second, or even a third dose of ipecacuanha is rejected. In such cases whether the drug is given in its simple form or combined with opium or otherwise, it is vomited up in a short time, while the patient is at first much disturbed and later on depressed proportionately, and the stomach remains so irritable that for quite a time afterwards the administration of any other drug or even of food results in an attack of vomiting. Under these circumstances the first thought that would suggest itself to the physician is to wash out the lower gut with some luke warm water or mild antiseptic solution and then to administer the ipecacuanha in suitable form

per rectum. This method does succeed in a few cases, but the remarks I am about to make are restricted to that set of cases which, few though they be, are still to be met with in practice and in which the rectum is in so inflamed and irritable a condition that it actually expels the entire enema before it is able either to stay long enough or to reach sufficiently far in order to allow of absorption of the active principle or even of local contact. I have not infrequently met with such instances, and having, in the earlier of these cases, been disappointed in the use of ipecacuanha, I was compelled to find other methods of dealing with such cases. These methods I will shortly have occasion to describe. Again, it occasionally happens that although no particular difficulty is encountered in getting the patient to retain the ipecacuanha, the use of this drug is, for some reason or other, not attended by the least improvement in the condition ~~in the condition~~ of the sufferer. Instances of this have occurred in the experience of Clouston, Latham, Davidson and others, and similar instances have occurred in my practice. What the cause of this failure in the use of the drug is due to in a certain proportion of cases which, apart from the deeper questions of pathology, clinically present symptoms similar to other cases of the disease, it seems impossible to determine with our present amount of knowledge on the subject. The fact, however, remains that in this set of cases the physician finds himself

face to face with the question of having to find a suitable substitute for a remedy upon which he has perhaps placed a little too much hope. In some cases of this kind where I have not succeeded with ipecacuanha alone, I have been tempted to try it in combination with opium, soda, chalk, and a variety of other substances, but often to no purpose. Lafleur, confining his remarks to the form of dysentery which he distinguishes as amoebic, says that he has tried the ipecacuanha treatment but has been unable to observe any effect, beneficial or otherwise.

Such then are the main considerations involved in the subject of treatment of acute dysentery with ipecacuanha. Taking into account, then, not only the experience of the majority of those who have within recent years employed the remedy in a systematic manner, but also my results from the use of the drug in cases which occurred both in private practice and in the course of my public service, I think I will be justified in embodying merits and demerits in the following summary. While in the absence of any better or generally more trustworthy form of curative agent, it seems right, on the whole, to give to ipecacuanha, either alone or in suitable combination, the first position among remedial measures against acute dysentery, yet, considering that it fails entirely to respond in a certain proportion of cases of this disease, the remedy must not be looked upon as anything like infallible and the physician must be armed with a knowledge of other methods of treatment

which, in the cases referred to, will prove more suitable than that with ipecacuanha.

Ipecacuanha in chronic dysentery.-

And while so much can be said with regard to the value of the drug in acute dysentery, its action in the chronic forms of the disease is by no means as marked. In the subacute attacks which occur in the course of a chronic dysentery and even in the more acute relapses of a tropical dysentery I have at times obtained good results from the use of this drug; but in truly chronic cases I have not noticed any such benefit. According to Yeo, however, even in this class of cases advantage does sometimes follow the use of this remedy, while Manson tells us that the drug should always be tried in the mild dysenteries of a chronic nature which are to be met with and which originally had been contracted in the tropics. Yet it undoubtedly is the case that ipecacuanha holds quite a secondary place in the treatment of the chronic disease,- secondary to such remedies as some astringents, mercurials, etc.

Mercurial remedies.

Many instances have been placed on record where, after failure has been encountered in the use of ipecacuanha, opiates, bitters, astringents, aromatics, and the other ordinary means of treatment, mercury in one or other of its forms has stepped in and effected a cure. Latham tells us of such an instance in his ac-

count of an outbreak in the Penitentiary in 1823-24 in the course of which mercury, in the form of gray powder or of calomel, was the only substance which proved of the slightest avail in the treatment. Writing about this at one time, Dr Latham says that after all the remedies common to European practice, including ipecacuanha, had proved ineffectual, "calomel and opium became the settled practice". Again, Mayne states that in the dysentery connected with the famine of 1848 and 1849 in Dublin he found mercury to be the only useful remedy. The experiences of Trousseau and of Berenger Feraud bear out the same, while Niemeyer speaks in high praise of one grain of calomel combined with a quarter of a grain of opium and given every two hours. Quincke used calomel in slightly more than ½-grain doses in two cases of amoebic dysentery and found that the amoebae diminished in number but did not altogether disappear. Dr Testevin prescribes 8 grains of the drug daily for two or three days, along with camphor and opium; he stops the use of it as soon as the action on the bile is established as seen in the condition of the stools. In American practice the drug has within the last ten years fallen into disuse and Brayton Ball of New York thinks that the reaction against the use of calomel has perhaps gone too far. The employment of calomel in dysentery, according to the testimony of Trousseau, was first introduced by Dr Amiel, surgeon to the 12th regiment stationed at Gibraltar in 1812. Trousseau further

tells us that huge doses (30 grains), if given night and morning and continued until the colour of the stools shows the presence of bile, will relieve all morbid symptoms; also that the remedy acts first as a substitutive and next as an alterative. Morehead has been in the habit of administering 7½ grains of calomel, ½ grain of ipecacuanha, ½ grain of opium, followed next morning with ½ to 1 ounce of castor oil. Manson says that calomel in combination with ipecacuanha should be resorted to where blood and mucus persist in the stools and other symptoms continue after treatment with the usual remedies have been tried. He recommends one grain of calomel and one grain of ipecacuanha to be given every five or six hours, salivation being avoided; moreover, he does not appear to favour the method of treatment with calomel from the commencement and thinks this mode perhaps best suited to the croupous forms of the disease.

There have been many supporters of the calomel treatment in dysentery, and prominent among them, besides those already mentioned, were Annesley who advocated its use in 1822, and Dr J. Smith of Edinburgh who, writing in 1833 on epidemic dysentery, recommended 20-grain doses of calomel to be given so as to fall short of salivation "the more common measures having failed". On the other hand, Parkes in 1846 condemned the use of this substance on the ground that it frequently gave rise to profuse salivation, in many cases aggravated

tenesmus, increased the blood in the stools, and in poisonous doses caused intense congestion of the colonic and rectal mucous membrane; he adds that he is therefore "unable to conceive the therapeutical indications on which its use is founded". At the present time, the treatment of dysentery with this salt of mercury is not looked on with much favour in Indian practice generally for other methods have been found more satisfactory.

The other forms in which mercury has been, and still is frequently used in the treatment of dysentery, are the pilula hydrargyri (Blue pill), liquor arsenii et hydrargyri iodidi (Donovan's solution), and liquor hydrargyri perchloridi. I have seen the last of these administered by the mouth and stomach with entire success in a case where ipecacuanha completely failed. Chowdhovry calls attention to the set of cases in which large doses of ipecacuanha are inadmissible by reason of the nausea thereby invoked preventing the patient from taking a sufficient amount of nourishment and where small doses (3 to 5 grains) with acacia and soda may be borne but only sometimes do good. In such cases he has found the greatest benefit in the use of perchloride of mercury. He used five minims of the liquor hydrargyri perchloridi in 2 to 8 drachms of water. The chief action exerted by this agent is no doubt that of a strong intestinal antiseptic. In the form of rectal injections the use of this preparation

of mercury has been greatly condemned by Maberly who says that it gives rise, even in very weak solution, to acute pain.

In chronic forms of the malady, Buchanan assures us, great benefit has been derived from the use of the following combination in which the perchloride of mercury plays an important part.

R

Liq. Hydrarg. Perchlor.	m xv
Tincturae Opii	m v
Tinct. Nucis Vomicae	m ii
Aq. Destil.	ad ℥ i

Sig. One such dose ℥ or 4 times daily.

(to be continued for 2 or 3 weeks if necessary).

This brings us next to a consideration of the form of treatment which is largely in use at the present day when not only is the value of antisepsis fully recognised, but also the parasitic nature of the disease all but established.

Intestinal antiseptics.

I will for the present confine my attention to the more direct methods of carrying out this plan of treatment with the local application of cleansing or antiseptic fluids, leaving for a later period the consideration of the use of mild laxatives which by their action help to carry away deleterious accumulations from the intestines. Dr King lays great stress on the cleansing of the bowel, whether as a preliminary step

to the application of local remedies or as a method of treatment in itself. He tells us that he has seen a severe case of acute dysentery cured by means of a warm bath, fomentations to the abdomen and copious warm water injections per rectum, with no medicine, and this method he has termed the "hydropathic treatment" of the disease. Here of course the chief action must have been a mechanical one, but if there is superadded to this a mild antiseptic action it is quite conceivable that the good effect will be much enhanced; and for this purpose numerous substances have been from time to time put into use within recent years.

Thus, Testevin has recommended the following plan. First wash out the bowel with an enema containing 15 grains of Boric or Salicylic acid, and afterwards administer the following combination as one injection.

R

Creasoti puri	m xv
Tincturae Opii	℥ x
Milk (or broth)	℥ v
Aq. bullient.	℥ vi

Sig. The enema, to be used as directed.

The injection should be retained as long as possible and if much irritation supervenes, a suppository of belladonna and cocaine should be introduced into the rectum. Ball remarks that the method of treatment by rectal injections is growing in favour, but he very wisely remarks as to the possibility of damage to and rupture of

the colon during the manipulation and therefore the caution which is necessary in adopting the plan. In one case he employed in this manner quinine and the subnitrate of bismuth with complete success.

Dr Sosovsky, a Russian, has used large enemata of a half per cent solution of creolin with much advantage. He repeated the injection from two to four times a day using at each period generally about five pints of the solution. He quotes numerous cases in which he employed this treatment and he shows that in the great majority of them the patient was cured on the third day of the treatment. Dr Kolokoloff has used a 1 per cent solution of the same drug in adults with great success and without the least burning sensation being produced in the abdomen. Fouquet uses a saturated solution of boric acid at 90° or 100° F. according as to whether there is little or much tenesmus present; he employs a double-channel tube for the rectum and a large quantity (3 to 4 quarts) of the solution. This method, he says, cures the tenesmus, lessens the evacuations, diminishes the fever and thirst, and makes the stools healthy. Yeo recommends a solution of borax, 5 grains to the ounce, or of borax and bicarbonate of soda, 5 grains of each to the ounce, with a few drops of spirits of camphor and tincture of eucalyptus, and he says this helps to wash away shreds of mucous membrane along with foul inspissated mucus and to promote healing of the ulcers. A solution of quinine (1 in 5000) was first used by Losch

for this purpose, and since then solutions twice, five times or even ten times as strong have been employed with impunity, three or four times a day.

Solutions of corrosive sublimate (1 in 5000 or 3000 of water) have been used for the same purpose, although Maberly found it so unsuitable.

Besides the method of administering substances per rectum to produce intestinal antisepsis, the plan of giving them by the mouth and stomach has received attention. I have used salol in 10 to 15 grain doses three times a day, sometimes in combination with bismuth, and have obtained excellent results. Benzonaphthol may be given for the same purpose in doses of 8 grains every four hours; it breaks up into Betanaphthol which remains in the intestines. Or, Beta-naphthol itself may be administered, 10 grains being given thrice daily. Resorcin has the advantage of being very readily soluble in water as compared with the three preceding preparations and may be ordered in 10-grain doses three times daily; it should however be given well diluted with water and flavoured with syrup of orange or glycerine.

Fayrer and Ewart have found 20-minin doses of turpentine in milk, given thrice a day, act exceedingly well in slow cases with ulceration, so much so that they have considered it quite unnecessary to use the sulphate of copper, nitr~~tae~~ate of silver or other vegetable astringents by the mouth, or large nitrate of silver

or other mineral enemata. Turpentine, according to them, acts as a stimulant on the capillary circulation and promotes healing of the ulcers, but it is probable that in addition to this the antiseptic action of the remedy is of importance. Ralfe also mentions the benefit to be derived from the use of turpentine and castor oil in cases with a large ulcerated surface and discharges of an offensive character. Dr Andrew Duncan of Greenwich has tried turpentine alone but with somewhat indifferent results. Numerous other substances have been used on the lines indicated above, with greater or less success. It is always well to keep the principle of this mode of treatment in mind, for it not infrequently happens that its application is attended with very good results.

Aperient remedies.

I have said that one of the ways in which the production of intestinal antisepsis can be effected, or, at any rate, aided, is by the use of aperients. It is, of course, highly desirable not only that accumulations of foeces in the bowels should be prevented or removed, but also that the whole structure of the intestines should be gently stimulated to healthy action. Further it is essential that the antiseptic action of normal bile should be exerted upon the unhealthy walls and contents of the intestines, and these various considerations are to be taken into account in making our selection of the aperient remedy to be employed here.

Something which will produce evacuation, gently stimulate the parts, and not irritate but soothe is what we desire, and if to these qualities in an aperient is added that of a mild cholagogue, we have all that is suitable and necessary for our purpose. The systematic use of castor oil has been recommended by Ralfe for the removal of scybalae and irritating discharges, and, according to him the remedy is applicable in all stages of the disease. If to each dose ~~is~~ are added 8 minims of the tincture of opium, the tormina and tenesmus first disappear, next the stools become less numerous in regular gradation and assume a feculent character. He says that still better results have been obtained by the addition of bismuth or haematoxylon, the former serving to decrease the catarrh, the latter to restrain undue peristalsis and thus allow of more complete digestion. He suggests that half an ounce of castor oil be given twice a week and a mixture containing haematoxylon thrice daily. According to this observer, in the earlier stages this form of treatment is of value owing (1) to the mechanical action of the soft, non-irritating flux from the small intestine sweeping the scybalous masses, decomposing mucous membrane and undigested food before it, and (2) to the remedial action on the ulcerated surface like that produced on the inflamed mucous membrane of the bladder by normal urine. In the later stages, he says, the treatment relieves the tendency to constipation.

Without attaching quite the same degree of import-

ance to this remedy, many practitioners have employed the treatment with castor oil with a fair amount of success. In the case of children I have found small and repeated doses of the oil in the form of emulsion an excellent mode of treatment. The following preparation in doses varying with the age of the patient will be found very serviceable in the dysentery of children as well as in the mild cases which sometimes occur in adults.

R

Olei Ricini	℥ i
Mucilaginis Acaciae	ʒ vi
Syrupi	ʒ ii
Olei Menthae Piperitae	m iii
Aq. destil.	ad ℥ iv

Where considerable irritability of the rectum is present or where this canal is packed with scybalous masses a small injection of castor oil with a few drops of laudanum has been found useful in soothing the irritable condition or causing an evacuation. This is one of the few circumstances under which I would combine such remedies together, for Sir Thomas Watson says "it is the practice of some physicians to prescribe laxatives and opium together; but in this complaint it is better to alternate them".

The action of ipecacuanha as a cholagogue aperient has been referred to already. Salines act, as it were, by flushing the intestines and, like calomel, they have

been used in the first stage to clear out the canal prior to the introduction of other remedies either by way of the mouth or of the rectum. The salines most used, especially in France, are the aperient sulphates, such as sodium sulphate in doses varying from 2 to 8 drachms according to the case. Magnesium sulphate is generally not to be preferred as it is somewhat irritating. If the result yielded by the use of any of these remedies is a positive one, the tenesmus disappears and the stools become more feculent in character.

Opiates.

When Sydenham, in the 17th century, first applied opium in the treatment of dysentery and noticed the results he obtained, he burst into eloquent praise of the Creator who in this remedy conferred so great a boon upon mankind. The sanction which the high authority of Sydenham gave to the use of the drug, soon caused it to have a very extensive application and for many years it was looked upon as the chief remedy. Without going into anything like detail regarding the different phases which the employment of opium in this disease has gone through, I will pass over a period of very many years and sum up the medical opinion of the present day in the words of Ball who says that the treatment of dysentery by means of opium is both "illogical and inadvisable, for cure does not consist in suppression of symptoms". Undoubtedly the drug is of value in the management of many urgent symptoms and enough cannot be said

in its praise in this respect. By the mouth it may be administered in the form of opium itself, but other preparations are also frequently used, such as the compound powder of ipecacuanha (Dover's powder) containing 1 part of opium in 10 of the powder, or the pulv. cretae aromaticus cum opio (1 in 40), or pulv. kino. compositus (1 in 20), or the tincture of opium (laudanum). One-twelfth of a grain of morphine injected hypodermically every hour and a mustard plaster applied over the abdomen have been recommended by Testevin for diminishing peristalsis and relieving apin. Turpentine and laudanum stupes applied to the abdomen are very useful in lessening the pain of acute dysentery.

Opium, in its internal uses, is very often combined with other remedies; thus, the following mixture has been recommended by Yeo,

R

Pulv. Ipecac. Co.	gr. v
Bismuthi Subnitratis	gr. xx
Magnesiae Levis	gr. v
Mucilaginis Tragacanth.	℥ i
Infusi Simarubae	℥ i

Sig.
One such dose twice or thrice daily.

In other cases three grains of Dover's powder may be combined with $\frac{1}{4}$ gr. of the sulphate of copper in a pill and given thrice daily. Or, 20 minims of the tincture of opium may be combined with 10 gr. of the sulphate of copper and four ounces of water and adminis-

tered as a rectal injection; or again, ½ gr. of powdered opium may be made into a pill along with 2 gr. of the ointment of kaolin and ¼ gr. of the nitrate of silver, and three such pills may be taken in the day. I have obtained very good results in the later stages from the use of gr. xv of the salicylate of bismuth and one-twelfth of a grain of morphia, as prescribed by Manson. I have also found benefit in using the following combination alternately with suitable doses of castor oil emulsion, in some cases.

R

Pulv. Ipec. Co. gr.v

Bismuthi Subnit. gr.x

Sodii Bicarb. gr.v

Pulv. Acaciae gr.v

Sig.

One powder thrice daily.

The following is a plan which I have seen practised by the natives of Bengal in cases of dysentery. A bael fruit just on the point of ripening, is taken and a small opening made in the hard rind. Then with a suitable appliance a portion of the pulp is scooped out from the centre of the fruit. In the case of an average sized bael a quantity of opium equivalent in weight to a half-rupee (or a shilling) ia added, the scooped out portion of the pulp is then replaced, the opening in the rind is closed, and the whole fruit is put amongst hot cinders to roast. After this the rind is cracked and the pulp of the fruit, which has by this

time become saturated with the opium, is administered to the dysenteric patient in doses suitable to his age. On enquiry I found that the remedy was not usually applied in the case of children. It is probable that the astringent property of the unripe bael-fruit combined with the well known properties of opium are concerned here. I have seen some good results follow this plan of treatment, but I do not think that the elaborate details of the method add any new virtue to the astringent and anodyne properties of the drugs.

If, then, exception is made of the very mild forms in which dysentery does sometimes manifest itself, and if account is taken of the more or less severe form in which the disease is usually met with, it may be said that the use of opium or any of its preparations must not be trusted to for effecting more than a mere abatement of some of the distressing symptoms, such as pain, tenesmus, vomiting, irritability of the bowel, etc. Opium, especially in the form of the tincture, finds its greatest use in dysentery as a first step in the ipecacuanha treatment; reference has already been made to this use and to its action in lessening the sensibility of the stomach.

Astringents.

Under this heading is comprised a large number of remedies which have found, generally speaking, a somewhat important place in the medicinal treatment of dysentery. Opium, Bael, Kurchi (Indrajao), Tannic

acid, Gallic acid, Cocaine, Pomegranate, Mangosteen, Kino, Catechu, and Haematoxylon are some of the more important vegetable products that have been used in this manner, whereas Alum, Bisulphate of iron and alumina, Perchloride of iron, Acetate of lead, Bismuth, Sulphate of zinc, Nitrate of silver, Sulphate of copper, and the dilute mineral acids are among the mineral substances which have been employed for their astringent effects. Some of these remedies have been administered both by the mouth and in the form of rectal applications, as for instance opium which, however, has already been dealt with in the foregoing pages. Others have been employed as internal medicaments given by the mouth, such as Bael and Kurchi of which I shall have more to say a little later on. The substances of the remaining set, though they have sometimes been administered by the mouth, find their uses chiefly in the form of injections per rectum, as for example Alum, Sulphate of Copper, or Nitrate of silver.

Tannic acid or tannin, an acid extracted from galls, has the property of coagulating albumin and thereby exerting an astringent influence when administered internally until (and this is the important point) it is converted in the intestine into gallic acid, a substance which has no power to coagulate albumin or to produce any local astringent action. Internally tannic acid has been administered in repeated large doses of 30 grains; its action is, however, uncertain and its

effects upon the lower portion of the intestines, at any rate, cannot be relied upon owing to the change which the substance undergoes in composition. Gallic acid, also a substance prepared from galls, produces no astringent effect when injected into the rectum. Easby mentions having tried gallic acid in combination with bismuth and ipecacuanha in the form of rectal enemata; the treatment failed to produce any good result whatever. Similarly I have tried the effect of tannic acid in a few cases of dysentery but with no particularly encouraging results. Thus the use of these drugs is not to be looked upon as of any special value in the treatment of this complaint. The following is a convenient form in which tannic acid may, if desired, be used locally in the form of suppositories,

R

Acidi Tannici	gr.xv
Opii	gr.iii
Olei Theobrom.	3 iiss

To be divided into 4 suppositories.

Sig. One to be used as directed.

Cocaine, the alkaloidal principle derived from the dried leaves of Erythroxylon coca, has in the form of the hydrochlorate been employed for its astringent effect to which is added a local anaesthetic action. It is used in the form of suppositories or of rectal injections. Sandwith calls attention to the use of suppositories containing this drug to allay the pain caused by

enemata of various substances.

The bark of the Pomegranate root (Punica granatum, nat. ord. Myrtaceae) has been employed against dysentery. By physicians it is conveniently prescribed in doses of 2 to 4 ounces of the decoction of the root. By the natives of Upper India, and even Bengal, I have seen it used in the form of the fresh juice squeezed out of the entire unripe fruit, including the rind. The astringent property is, no doubt, due to the tannin which is present. In cases of scorbutic dysentery the use of the fresh juice is exceedingly valuable.

Various preparations of the rind of the Mangosteen (Garcinia mangostana, found in the Straits and Singapore) have, owing to their astringent property, proved of immense benefit in diarrhoea and dysentery, particularly in the chronic diarrhoea of children. Messrs. Smith, Stanistreet and Co. of Calcutta have prepared a syrup of Mangosteen rind which is both palatable and effective as a remedy in the milder forms of dysentery.

Kino (Pterocarpus marsupium, nat.ord. Leguminosæ) exerts its astringent property in virtue of the kino-tannic acid of which there is as much as 75 per cent in its composition. In the form of the pulv. kino co. (1 of opium in 20) it is much used in dysentery in doses of 10 to 20 grains. In a child of 4 years, gr.iv of pulv.kino co., gr.iv of pulv.ipecac.co. and gr.iii of phenacetin produced remarkably good results.

Similarly the compound powder of catechu (20 to 40 gr), the tincture of catechu (½ to 2 dr) and the extract of haematoxylon have been used for their astringent properties, alone or in combination with bismuth.

Alum has found a great advocate in John Hepburn who, in a case where opium, lead, bismuth, ipecacuanha, Dover's powder and many astringents failed, adopted the plan of treatment with alum. He administered two enemata a day, each consisting of half an ounce of alum in half a pint of water. This injection at first produced a certain amount of pain which, however, soon subsided; with the fluid there came away sloughs and shreds, next the tenesmus diminished, the stools became less numerous and more solid, and after ten days of treatment the patient quite recovered. Again, we have on record a case in which Whittaker succeeded in saving a patient in an advanced stage of the disease, by means of three copious enemata each containing 3 drachms of alum in 3 pints of water.

Macnamara has used the bisulphate of iron and alumina, and sulphur in the treatment of dysentery.

The perchloride of iron, in the hands of Stephen Mackenzie, has not yielded as good results as the nitrate of silver has done.

The acetate of lead, especially in combination with opium, is frequently of service, either in the form of pilula plumbi cum opio used internally in 4-gr. doses thrice daily, or as a suppository (suppos.plumbi co.)

inserted per rectum twice daily. In addition to the astringent action, these salts of lead produce also a slightly sedative effect. The acetate of lead for dysentery has been highly recommended by Dujardin Beaumetz who used it in solutions of 8 gr. to the ounce of water.

Bismuth has been very largely employed, both internally by the mouth as well as in the form of rectal enemata, alone or in combination with other agents. Dr Houghton is a great supporter of the method of treatment of the subacute and chronic stages by means of bismuth injections and he says that owing to this a great many hopeless cases have recovered. His usual plan is to order half a drachm of the subnitrate of bismuth to be rubbed down with half a drachm of powdered gum in two ounces of cold water and injected from one to three times a day according to the severity of the case, the enema being retained as long as possible. If the application is properly made, he says that the severe tormina and tenesmus will be relieved in a very short time. Dr King tried Houghton's method on a large scale in tropical India and entirely corroborated the conclusions previously arrived at by the latter. King found the use of bismuth particularly beneficial under two sets of circumstances, (1) in order to soothe the rectum after the injection of nitrate of silver, and (2) in the dysentery and diarrhoea associated with famine in India, in which case

he found 10 to 20 grains of Bismuth in combination with Dover's powder the best form of treatment. The value of bismuth especially in the subacute stages of the different varieties of dysentery has been noticed by Trousseau who has also used with success the thiosulphate (or so-called hyposulphite) of sodium as a rectal injection to arrest putrid fermentations. In chronic forms of the disease three drachms of the subnitrate of bismuth and three drachms of the salicylate of sodium mixed with a pint of mucilage of quassia seeds have been injected per rectum after the bowel was first cleansed out with a castor oil enema followed by one consisting of a solution of boric acid. If the injection is retained for a sufficiently long time, it is said that the results are very beneficial. The action of bismuth combines that of an astringent with that of a protective agent for the intestinal mucosa; it has, further, a tendency to check vomiting and both this and the anodyne property it possesses are enhanced when the salt of bismuth is combined with a little morphine.

Sulphate of zinc has from time to time been employed and Trousseau tells us that it has been administered by Lasegue in dysentery in the form of an injection which contains 45 grains to 8 ounces and which he terms his "intestinal collyrium". The following two substances have, however, been far more largely used for this disease.

Mackenzie, a great advocate for the use of the ni-

trate of silver, urges the strong necessity for local treatment with some suitable mineral astringent or mild escharotic where the mucous membrane is in an ulcerated condition. Dr Horatio Wood of Philadelphia first recommended the treatment with large enemata of nitrate of silver and he termed this "the rational treatment of dysentery". Since then Ringer, Gairdner, Bristowe, Niemeyer and others have also recommended the use of the same drug, but they have not specially pointed out what Mackenzie lays such stress upon, viz. that the injections should be copious. Wood and Osler attach much importance to this point and advocate the use of 3 to 5 pints of a solution varying in strength from 20 to 40 or even 60 grains of the nitrate of silver to the pint. Mackenzie has used in a single enema 60 grains in 3 pints of water. He tells us that the irrigation should be carried out without using the slightest force, that a long flexible tube such as an oesophageal bougie should be used well lubricated, that this tube should have no terminal opening but only lateral apertures, and finally that it ought to be inserted high up (8 to 12 inches) into the rectum while the patient lies in the lithotomy position. If an enema containing this large quantity of the salt of silver is retained long and there is fear that toxic effects may arise, a solution of common salt, which should be at hand, must be injected in order to neutralise the nitrate of silver. Such a form of treatment, needless

to say, is quite unsuitable for disease of the intestine above the ileo-caecal valve. Testevin has found rectal injections of the nitrate of silver of much benefit in the very severe cases of the disease, and Trousseau has obtained very good results in chronic cases with nitrate of silver injections, ½ to 1 gr. to the ounce. The drug has also been used internally in the form of pills in suitable combination. Whitla prescribes the following, nitrate of silver gr.i, powdered ipecacuanha gr.iii, the hydrochlorate of morphine gr.½ to be made into a pill with say a little kaolin ointment; one pill is to be taken every 6 or 8 hours. Or, a sixth of a grain of nitrate of silver may be given along with one-eighth of a grain of powdered opium an hour after meals. This salt of silver combines an irritant stimulating action with an astringent influence and hence the benefit which is derived from its use in cases with slow-healing ulcers.

The sulphate of copper has, by some, been preferred to the preceding. Dr Sandwith recommends the use of enemata in dysentery for two reasons, because (1) the disease at its onset is local, and should be treated by local means, and (2) the amoebae can be destroyed by antiseptic solutions, such as that of quinine (1 in 5000). Sandwith was formerly in the habit of using the nitrate of silver, but of late he has expressed a preference for the sulphate of copper. Easby is another strong advocate of this salt of copper. In a very se-

vere case of dysentery with much haemorrhage and tenesmus he employed the following injection by means of a soft gum-elastic bougie inserted 15 inches into the rectum.

R

Cupri Sulphatis gr.x

Tincturae Opii ℥ i

Aquae ℥ iv

Sig.
The enema.

He used three injections on three successive days and the case ended in complete recovery.

Notwithstanding the marked astringent action of the salt there is some diversity of opinion as to its value in dysentery. Thus, I have already called attention to the opinion which Fayrer and Ewart have expressed, namely that they consider the use of nitrate of silver and of sulphate of copper as quite unnecessary in the treatment of dysentery.

The dilute mineral acids, especially dilute sulphuric acid, sometimes come of use in checking the annoying discharges of mucus and blood which are occasionally passed by patients who have suffered from an acute attack of dysentery at some previous time. This acid and the dilute nitro-hydrochloric acid given on alternate days in 10-minim doses in a little water after meals act very well indeed in some of these mild cases where the anxiety is sometimes very great at the occurrence of the slight discharges referred to.

Aromatics.

Very many substances possessing aromatic properties have, like various other agents, passed into the category of remedies against dysentery. Of these, however, cinnamon has been brought into notice by Dr Avetoom in a paper upon the results of some cases which he treated with this drug. The writer says that the method is employed in acute dysentery and is a modification of the plan mentioned in the works of a Persian physician. It consists in administering night and morning one drachm doses of the powdered cinnamon bark made into a bolus with a little water. Avetoom tells us that he cured 30 cases with this treatment and he adds that the average case yielded to one or two doses of the remedy whereas his worst cases did not require more than half a dozen. He does not, however, mention the total number of cases in which the method was resorted to or the proportion of success which his results indicate. In his opinion this plan is vastly superior to the ordinary ipecacuanha treatment since it is pleasant for the patient, causes no vomiting and acts better and quicker than that drug. He insists upon the treatment being commenced early in the course of the disease. As a point of interest he mentions that it was the practice of the Persian physician to administer 1½ drachm doses of the powdered bark mixed with cream, on empty stomach in the morning.

Bitters.

Various species of quassia, and chief amongst them, the Q. Simaruba (Ailanthus glandulosa) have been employed in the treatment of dysentery. Q. Simaruba, unlike some of the other forms, contains much gallic or tannic acid, besides a volatile oil and the bitter neutral principle, quassin. It was first introduced into American practice and in the beginning of the 18th century it was brought over to Europe and used for the dysenteric fluxes of blood. Recently it has fallen into disuse in Europe though it is said still to be much used in the East. As an anti-dysenteric 4½ grains may be given 5 or 6 times a day, or the infusion made with 8 parts in 1000 of water may be used instead. This drug is said to be of special service in the subacute stages as well as in the chronic condition of the malady. The presence of tannin in this variety of quassia must be kept in mind in prescribing it for this renders it incompatible with the per-salts of iron and some other substances.

Calumba has also been used in dysentery; it is a typical bitter, contains no tannic acid, helps the digestion and has, in general, a tonic effect.

The value of cinchona, especially in the malarious forms of the disease, is generally allowed. The fresh decoction of the cinchona bark is probably the best form in which the substance can be used.

Monsonia treatment.

John Maberly, in an interesting paper on the treatment of dysentery, gives the results of six years experience in the use of some varieties of monsonia. The varieties which he has been using are the M.Ovata and the M.Burkei, both South African plants. In a series of 100 cases which he quotes, 90 were acute; in these no ipecacuanha was used and with the exception of a few cases in which the pil.plumbi cum opio was administered, the entire treatment consisted in the use of 2 to 4 drachms of the tincture prepared from specimens of the monsonia, given every 4 to 6 hours. The average number of days during which a patient required to be under treatment of this kind was 2.3 an average much below that resulting from any other form of treatment. In the 10 chronic cases, the period of treatment was on the average 8.1 days; in only one of these cases did a relapse occur, which, Maberly says, was due to an old tincture being used, as was proved by the fact that a fresh preparation immediately cured the case. In a single instance the patient, a child, exhausted by long-standing previous illness, succumbed to cancrum oris. The advantages which Maberly claims for this drug over ipecacuanha are (1) that it requires no special preparation and can be taken by the patient without any need for his staying in bed, and (2) that it is efficacious also in chronic dysentery in which no other remedy proves

of use and which is often incurable or fatal. The monsonia is a genus of the natural order Geraniaceae, and comprises many varieties found in South Africa. The plant contains tannin, especially in the roots. As regards its properties, it is a weak astringent, but Maberly believes that this alone does not account for its action in dysentery; he is of opinion that the plant possesses a specific action on the poison of the disease. He comes to this conclusion because (1) the drug has very little effect on ordinary diarrhoea, and (2) preparations made from the dried flowering plant without the root were in dysentery quite as effective, if not more so than those in which the root was used and which therefore contained much tannin.

The results of Maberly's treatment with this drug are certainly very encouraging. I am not aware that any other investigator in South African practice has made any similar observations since Maberly published his paper in 1897. The matter should certainly not be lost sight of since it is one of very great practical importance. In Western India a variety of the plant known as the Monsonia Senegalensis is to be found, but I do not know that any particular medicinal properties have been noticed in connection with it. The tincture used by Maberly was prepared with 2½ ounces of the dried flowering plant or the root to a pint of rectified spirit.

Aconite. (Aconitum napellus, nat. ord. Ranunculaceae).

Dr Beatson, writing to the Indian Medical Gazette, recommends the tincture of aconite in dysentery in one minim doses given half hourly for 8 or 10 hours and thereafter in one minim doses every hour. As the result of this treatment, he tells us, the frequency of the stools, the pain and the fever diminish. In the opinion of Trousseau the virtue of aconite lies in the fact that it diminishes vascular tension, and relieves vascular excitement. Its value is probably greatest in cases with a malarial complication.

Iodine treatment.

Delioux de Savignac used in chronic dysentery a rectal injection of the following composition

Tincture of Iodine	℥ii to ℥i
Iodide of Potassium	gr. xv to xxx
Water	℥ vi to viii

He observed that as the immediate effect of this a slight colic resulted but it was easily dealt with by means of an injection of laudanum water. Eventually relief was given and this the physician attributes to what he terms a modifying action on the surface of the mucous membrane. Others are also said to have employed iodine with advantage in the proportion of 20 to 30 minims of the tincture to an ounce of water.

Chloral and Sulphate of Magnesium.

Dr David Punice has recommended as an abortive of dysentery chloral hydrate in a dose large enough to produce sleep (30 grains) in conjunction with one or two ounces of the sulphate of magnesium. The effect of this combination, he says, may be aided by subcutaneous injection of morphia.

Sulphate of Magnesium.

In October 1890, Dr Leahy published a note on the treatment of dysentery with a saturated solution of the sulphate of magnesium. In advocating this method he states as his opinion that it is quite as efficient, but much less depressing than the treatment with ipecacuanha. The method consists in administering drachm doses of epsom salts along with 10 minims of dilute sulphuric acid every one or two hours until the motions become copious, feculent and free from blood and mucus, the temperature falls and the pain and tenesmus cease. According to Leahy's experience, the treatment in different cases requires to be carried out for one, two and occasionally three days, but very seldom for a longer period. Further, he says that a mild astringent such as dilute sulphuric acid and the tincture of opium, may subsequently be used. Neale, in referring to this plan of treatment, tells us that Leahy's method is merely a recommendation of that devised by Dr Heberden and which was approved by Dr Ayres in 1847 and by Mr Ford in 1857.

Intravenous and subcutaneous injections.

After a series of investigations on the subject, MM Bosc and Vedel published in 1897 an account of a method of treating dysentery by means of large intravenous injections of warm solutions of common salt. As the result of the trial which they gave to this plan, they arrived at the following conclusions, (1) that large injections(of 40 to 60 ounces)of the chloride of sodium, 7 parts in 1000, constitute an energetic form of treatment, (2) that the measure should be adopted early and should, if necessary, be repeated (3) that there appear to be no contra-indications to this plan of treatment, and (4) that too large injections are to be looked upon as dangerous, while the rate of injection should not exceed 1 or 1½ to 3 ounces per minute. Besides being attended with some danger to the patient, the plan is one which is not well suited to the needs of an ordinary practice, and so in order that the measure should recommend itself for anything like general adoption, the physician will require evidence of even greater success than the results furnished by MM Bosc and Vedel show, Four cases only were treated by them in the above manner and we are informed that three of these survived while the fourth lived longer than he probably would otherwise have done.

Testevin tells us that in grave cases with collapse, where hot-air baths, hot water baths, hot bottles and sinapism failed, and where the hypodermic injection of

caffein and ether did not succeed in stimulating the heart, he injected half a pint or more of absolutely aseptic normal saline solution into the subcutaneous tissues twice or three times in 24 hours.

Indigenous Indian Remedies.

Belae Fructus. (Bael fruit).

Long before it was included in the list of officinal substances in the British Pharmacopoeia, bael was well known to the natives of every part of India for the medicinal properties which it contains. Called in Bengali "Bel" or "Bela" and in Hindi "Bela Si-phal", the fruit of the Aegle Marmelos (nat. ord. Rutaceae) is to be found all over India. The properties of the ripe and unripe forms of the fruit vary greatly from one another, for while the ripe bael is a mild laxative, the unripe is an astringent and is the form in which the substance is used for the purposes we are at present considering. The fruit is roundish, somewhat larger than a full-sized orange, with a hard woody rind; when unripe it is green outside, but as it ripens the rind becomes tinged with yellow. The thickness of this hard covering varies from an eighth to a quarter of an inch; the pulp in the unripe bael is firm, brittle and pale yellow, but as the fruit ripens this becomes soft and brighter in hue. The form in which it is usually exported and found in commerce is that of fragments of the hard woody rind with adherent dried pulp and seeds. The

only preparation of the fruit which is officinal, is the extractum belae liquidum, with a dose of 1 to 2 drachms. To suit the purposes of the practitioner, however, Messrs Smith, Stanistreet and Co of Calcutta have devised two very happy forms in which the substance can conveniently be administered, namely, the confectio belae aromaticus (dose 1 to 2 drachms) and the pulvis belae fructus (dose 2 to 4 drachms). But these are not the forms in which the vast numbers of Indian people utilise a remedy which experience and long practice has taught them to regard as invaluable in many bowel complaints. Anglo-Indian practitioners have for many years past been interested in observing and recording the various modes of preparing the substance peculiar to various classes of the natives. Thus, Buchanan tells us how they take the fruit, crack its hard rind, boil it in water, reject the fibrous septa and seeds, and eat the soft lining material with brown sugar; or make a sherbet of the ripe bael, straining it and acidulating with a little tamarind, or with milk-curds (tyre). I have already given a short account of the method by which a quantity of opium is put into an unripe bael and the fruit roasted, the preparation being subsequently administered in medicinal doses. There are very many other ways in which it has from time to time been employed, but one in particular, a preparation made with the fresh unripe bael and isupghool, came to be quite a favourite remedy with

me. I employed this method in a large proportion of the 420 cases of dysentery which I recorded in practice and I found the results exceedingly satisfactory especially in jail and hospital practice where I was able to follow the progress of the cases from onset to termination. The treatment succeeded in many instances where ipecacuanha either was not tolerated at all or failed to benefit the patient in the slightest degree. Such were the results which I obtained in jail practice, that where the ~~mortality~~ admission-rate had been 71 per 1000 before I took over medical charge, it came to be only one-half that number during my year of office. Nor was any sanitary reform carried out in the meantime to account for this fall of 50 per cent in the mortality; the prisoners were dealt with and the sick among them were treated under exactly the same circumstances otherwise than medicinally. The method of preparing and administering the remedies I shall describe presently when dealing with the subject of isupghool.

With regard to the composition of bael, very little is known, except that it contains no tannin and that its astringent property is therefore not due to that substance. As the bael ripens it loses more and more that astringent sour taste so characteristic of the unripe fruit, and it gradually becomes sweeter, a change which is probably due to the conversion of various acid bodies into sugar during the process of ripening. With regard to its action, experience in

its use has taught us to look upon the unripe bael essentially as an astringent, whereas the ripe fruit is generally a mild laxative. A noteworthy point, and one which I have observed, is that the ripe fruit, at any rate in the form of sherbet, if taken occasionally produces a mild laxative effect, whereas if taken regularly it has a distinct tendency to produce constipation. As to the therapeutic uses of the substance, bael, alone or in combination with such drugs as opium, kurchi, isupghool, bismuth, etc. has been employed chiefly in diarrhoea and dysentery. I have come across the opinion that when, after the dysenteric process repair has commenced, tormina and tenesmus disappeared, when the motions have become free from morbid materials and tenderness has decreased, and while the cicatricial tissue is still hyperaesthetic, bael in the form of liquor, extract or sherbet is useful as a tonic, astringent, balsamic, ~~aromatic~~, aromatic or aperient.

Cummin seeds.

The seeds of the Cuminum Cyminum, a genus of dicotyledonous plants belonging to the nat. ord. Umbelliferae, have been very largely employed against dysentery and with great success. The plant grows in Egypt, Syria, Sicily, Malta, and especially in Upper India and Rajputana. The seeds are about one-fifth of an inch in length, oval-oblong, greyish-brown, with longitudinal ridges and furrows on the average about

10 in number, and they terminate at one end in a short stalk. In general appearance the seeds are not unlike the anise fruit. They have a warm, aromatic taste and a strong spicy odour which is not at all disagreeable. The cummin seeds, moreover, contain a large quantity of essential oil and possess, in general, properties which are stomachic and astringent. In Bengali the seeds are known as "Jira", and in Hindi as "Zira". In Bengal the drug is employed as a household remedy against dysentery among the natives, and having observed its uses among those people, I subsequently applied it in a series of 22 cases of which all recovered. In 17 of these cases no other remedy was required or employed and it so happened that these were all mild cases of simple uncomplicated dysentery. In the other 5 cases I was compelled by noticing a want of improvement in the patients to resort to treatment with some other form of remedy. I therefore concluded that while it is an excellent and pleasant drug to use in the early stage of the simple mild forms of dysentery, especially in young patients, the treatment with this substance is not to be relied on in the latter stages of the disease or in the more formidable manifestations where much blood and mucus with shreds of mucous membrane and sloughs are being passed. The following was the manner in which I found it best to prepare the seeds for use. An ounce of the seeds, as they are obtained in commerce, were procured,

dried in the sun, dusted and picked. This quantity was halved; now, one portion was roasted over a slow fire and then powdered, the other half was pulverised without being previously roasted. The two portions were then passed separately through muslin cloths and kept in separate stoppered bottles. According to the nature of the case a dose consisting of 5 to 15 grains of each powder is taken, mixed together with a little brown sugar and administered three or four times a day, the patient being, of course, put upon a diet restricted in the usual way to milk, sago, sugar, and barley-water.

The powder prepared in this manner from the cummin seed, some of which has been roasted and the rest not, is termed by the natives "kutcha - pucka jira" (raw and roasted "jira"), and the fine-grained brown sugar ~~as~~ "kasi cheenee".

Cannabis Indica. (Indian hemp).

The parts from which the officinal preparations of cannabis indica are prepared are the dried flowering or fruiting tops of the female plants of Cannabis Sativa (nat. ord. Cannabinaceae) from which the resin has not been removed. But, apart from the tincture and the extract, which are pharmacopoeial preparations and which are restricted more to European practice, the Indians, as is well known, are in the habit of using the drug in various forms known, in Bengali and Hindi, as gunjah or ganja, haschisch, bhang, sidhi, etc. With regard to the use of the drug in any of its forms, I can-

not say that I have observed it to be attended with marked good effect in dysentery. And yet I am able to recall a case in which it played a very important part in relation to the disappearance of an attack of that disease. A young Hindu, about 30 years of age, formerly of steady habits, had suddenly taken to gunjah smoking with the result that he developed symptoms of violent acute mania. Being taken for a lunatic and apprehended in an attempt at some form of violence, he was sent to the district jail with a detention-warrant in order that I might submit him to medical observation for his mental condition. No history of the habit which this man had been addicted to was supplied to me but from the appearance and behaviour of the case I at once perceived the nature of the trouble he was suffering from. Deeming it unwise to stop the gunjah too suddenly, I allowed the patient a small quantity of the drug daily in the form in which he had been accustomed to it, but I diminished the amount steadily day by day. At the end of 10 days the mental condition showed decided improvement under the strict regime to which the case was subjected, and by this time the allowance of gunjah was stopped entirely. Within 48 hours of this time the patient developed a smart attack of dysentery. I then ordered 15-minim doses of the tincture of cannabis indica with mucilage of acacia and gr.x of the bromide of potassium to be given 3 or 4 times a day according to the indications of the case; there was,

however, no marked improvement in the symptoms of the dysentery which had developed. After a two days' trial of this plan I returned to that of allowing some gunjah to this patient and curiously enough the dysenteric symptoms at once began to abate and the attack gradually disappeared in the course of a few days. I understand that cannabis indica is generally regarded by native practitioners in India as a potent remedy in dysentery and I am informed that even gunjah-smoking has been recommended at the risk of the patient acquiring a habit for the drug. I believe that among Indian "cobirajes" the practice is to administer the remedy in the crude form in combination with other indigenous vegetable substances whose medicinal properties are known to them alone and a knowledge of which is jealously guarded by them as a secret treasure. The properties which cannabis indica possesses are those of a soporific anodyne, anti-spasmodic, and in large doses a nervine stimulant.

Kurchi. (Indrajao).

The bark and the seeds of the Holarrhena Antidysenterica (Wrightia Antidysenterica), nat. ord. Apocynaceae, found in Bengal, Central and Southern India, and Burmah, have been largely used in the treatment of dysentery. Under the Bengali names of "Kurchi" and the Hindi names of "Kureya", "Karchi" and "Indrajao" (the last of which is, so far as I am aware, restricted to the seeds), the drug is well known to both native and

Anglo-Indian physicians. An extractum kurchi (dose 5 to 10 grains) and an extractum kurchi fluidum (dose 1 to 2 drachms) have been prepared by Messrs Smith, Stanistreet and Co of Calcutta, to meet the large demand for a convenient form of a drug whose value in dysentery is now generally recognised. But I have obtained very good results from the simple, though less convenient mode of administering 5 to 10 grains of the powdered indrajao, either alone or in combination with the soft strained pulp of bael and a little brown sugar. An infusion and a tincture of the drug have also been prepared, the former with a dose of ½ to 2 ounces, and the latter ½ to 2 drachms. To anyone who has had the least experience in the use of Indian remedies against dysentery, at any rate as the disease occurs in India, the value of Indrajao will be too well known to require further description. Besides the tonic and astringent properties which the substance undoubtedly has, I believe that it exerts a febrifuge and a distinctly antidysenteric action. In the mild cases of adults as well as in the simple dysentery of children, it answers remarkably well if used in the early stages and it is an excellent example of those substances which frequently produce brilliant results in cases where ipecacuanha refuses either to be tolerated or to produce benefit.

Ispaghul. (Isubghole).

The Plantago Ovata (or Plantago Ispaghul) belong-

ing to nat. ord. Plantaginaceae, has its habitat especially in Sind, Beluchistan, and North-West India. The seeds of the plant are the parts which are employed medicinally and are known in Bengali as "Ispaghul", in Hindi as "Isubghole" (or as I have often heard it Isupgool), and in Persian as "Ispaghool". The seeds are very small, about one-eighth of an inch or less in length, apparently flat but really boat-shaped on close inspection, oval with one end slightly more pointed than the other, and brownish in colour. The dose of the powdered seeds is from 2 to 3 drachms.

A quarter of a century ago, when writing on the subject of the chronic diarrhoea of India, Fayrer drew attention to the benefit which the natives derived from the use of isupgool and he ascribed this good effect to the mucilaginous coating which was formed over the intestinal mucosa by the action of the moisture in the intestines upon the mucilaginous covering of the seeds. Now, the composition of the substance has, so far as I am aware or so far as literature shows, not been made the subject of special investigation, and the only properties which have been ascribed to the substance are those of a demulcent and astringent. I have used isupgool in combination with bael in a great number of cases of dysentery with much success. Whether these results are due to the combined astringent effect of the two substances or owing to any special property on the part of either alone, I am in any case inclined

to attach to the combination a value much greater than that for which it has received credit before. I have used the drugs in the early stages of mild attacks as well as in the advanced stages of severe ones, I have employed them where ipecacuanha has not been tolerated and I have administered them when that remedy has for some reason or other entirely failed, and in all cases I have secured results which appear to me to warrant the high position I give to them in the treatment of, at any rate, Indian dysentery. The good fortune I had of being in charge of a large district of Bengal where dysentery was so rife, gave me the opportunity of practising these methods upon large numbers, an end which otherwise I should not have been able to effect in the same manner. The medical reports for the Barisal Jail for 1898 as compared with those for previous years show a reduction of 50 per cent in the mortality from dysentery alone. And here let me say a few words as to the mode in which the substances were prepared for administering. A bael fruit, when fully developed in size but yet unripe, was taken fresh from the tree, and without having the rind removed, it was chopped into small cubes measuring about an inch in each dimension; these pieces were put in the sun to dry for a whole day. At the same time four ounces of fresh isupgool were procured, picked, dusted, and dried in the sun in a similar manner. On the following morning the cubes of bael and the isupgool were put into separate

pots of a suitable kind, to each a sufficiency of cold water was added, and the pots were boiled separately. The contents of the pots were not allowed to dry up or to be charred, more water being added if necessary, and the boiling was done on a slow fire, and continued until on the one hand the pulp of the bael was reduced to a soft consistency, and on the other the seeds of the isupgool were converted into a thick gummy solution. The contents of the pots were then allowed to cool and were separately strained through muslin cloths. The pale yellow paste resulting from the bael was kept in one vessel, while the light-brown viscid substance resulting from the isupgool was kept in a separate cup. According to the age of the patient and the nature of the attack a dose varying from a teaspoonful to a table-spoonful of each substance thus prepared was administered along with some brown sugar (kasi cheenee). The preparation should in all cases be recent. I have many records of cases which I could quote to show the results obtained from this treatment, but it will serve the same purpose if, without going into such detail or lengthening out this work at the present stage, I summarise my observations. If the patient is kept in bed, and on a diet which is suitable to the nature of his complaint, if his surroundings are of a hygienic nature and the disease not seriously complicated with concomitant maladies, this mode of treatment will be found to soothe almost immediately and to render the acute symptoms less acute.

The motions will diminish and will continue to do so in regular gradation, they will become less offensive and will assume more of the character of the stools in diarrhoea, while the tenesmus and tormina will gradually disappear. If the constitution is a tolerably good one, the patient will rally in a short space of time, often in the course of a week. I have occasionally tried the plan of checking the first onset of the disease with a large dose of ipecacuanha, preceded by opium and then resorting to the other method. The only cases of dysentery that I lost out of a total of 420 which from time to time came under my care were 9, a mortality of 2.1 per cent only. They were not all treated with the same medicinal agents, but in a large majority I put into use these Indian remedies occasionally in combination with one or other of the more recognised forms of medicinal treatment. My experience of them, as I have related, has been very favourable and thus I feel it my duty to bring them to the notice of others still better able than I am to judge of the merits of these substances. The subject is one of immense practical importance and one which I will certainly never lose sight of either in theory or, what is of more value, in practice.

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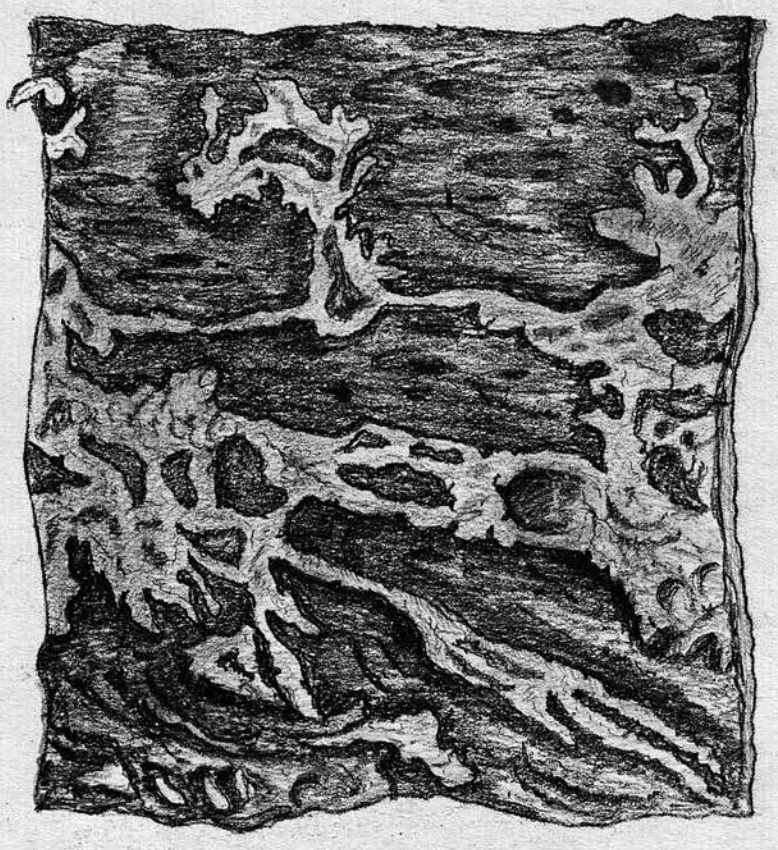
The following is a table showing the dietary of patients labouring under dysentery in the Whitworth Chronic Hospital, during the year 1818-19 (taken from the Medical report on the Whitworth Hospital etc. by John Cheyne. Dublin Hospital Reports Vol.III. 1822).

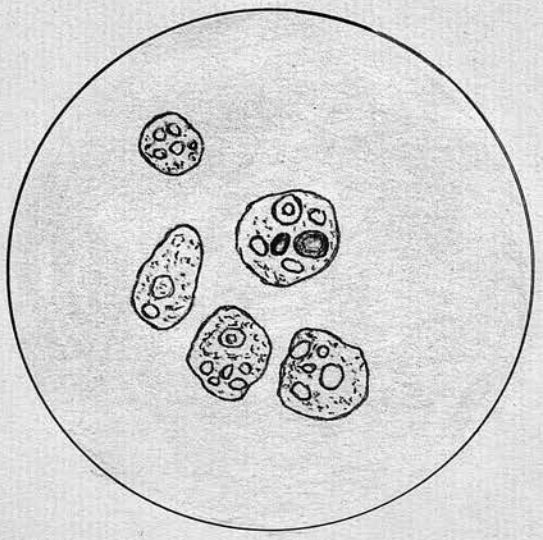
Diet.	Breakfast.	Dinner.	Supper.
Full.	White bread ½lb. New milk 1 pint. or Rice 4 oz. New milk 1 pint. Cinnamon & sugar.	Mutton ½lb. (raw, made into soup) White brd. ½lb	White bread 4 oz. New milk 1 pint. or Flour ½ pt. Cinnamon, etc.
Middle.	As above.	Whit. brd. ½lb New milk 1 pint Spice & sugar.	Flour ½ pt. New milk 1 pt. Spice & sugar.
Low.	Flour ½ pt. New milk 1 pint. Spice & sugar	Rice 2 oz. New milk 1 pt. Spice & sugar.	Flummery 1 pt. New milk 1 pt.

Plate No.I.

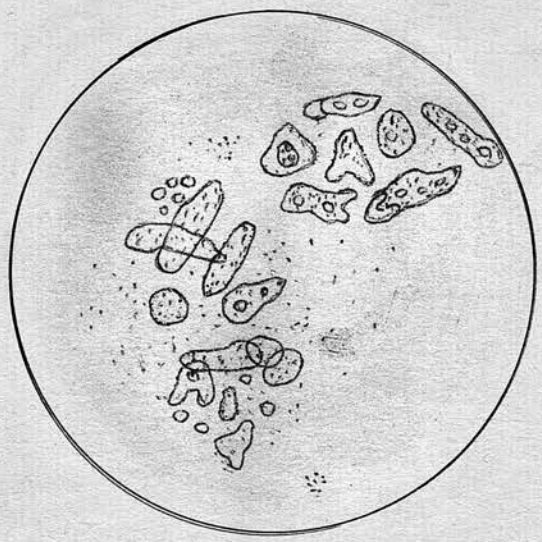


A portion of large intestine from a case of tropical dysentery, showing the ragged remains of the mucous membrane lying upon the muscular coat which is represented by the darkly shaded parts.

Plate No.II.

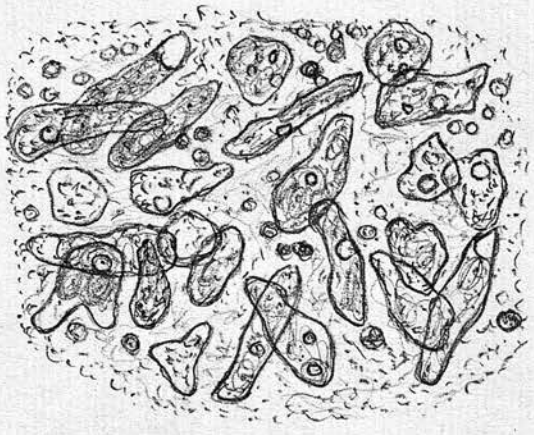


Amoeba dysenteriae, fixed
and stained (Councilman).

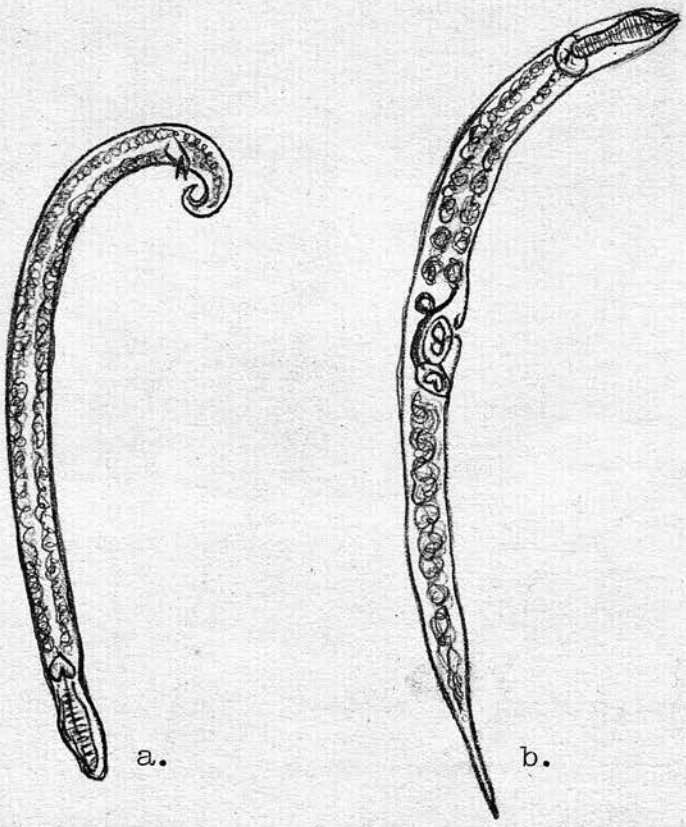


Amoeba dysenteriae
in stools (Losch).

Plate No.III.



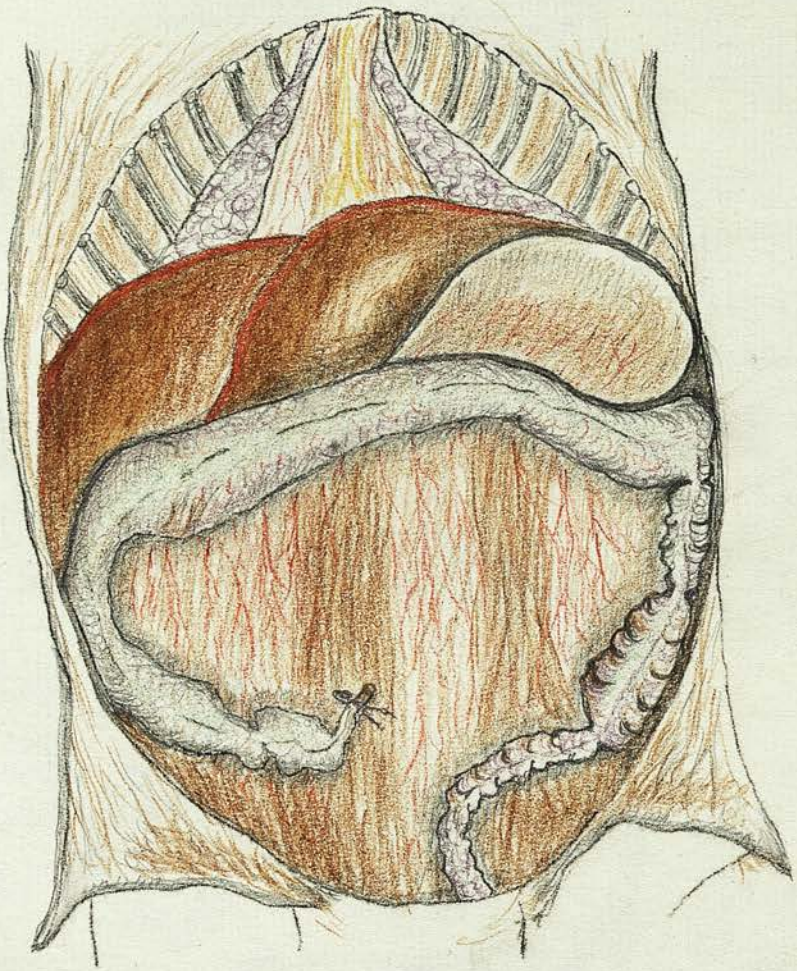
Amoeba coli in dysentery (Hamilton).



Anguillula stercoralis (Normand). Vide p 81.

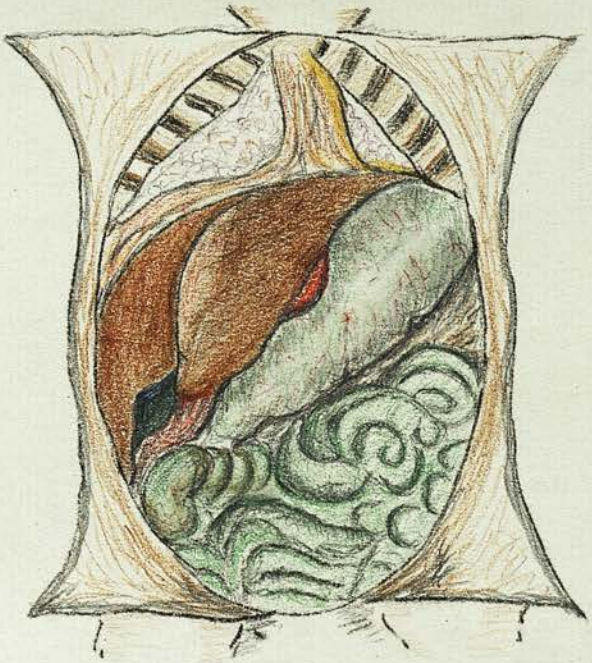
a. male, b. female parasite.

Plate No.IV.

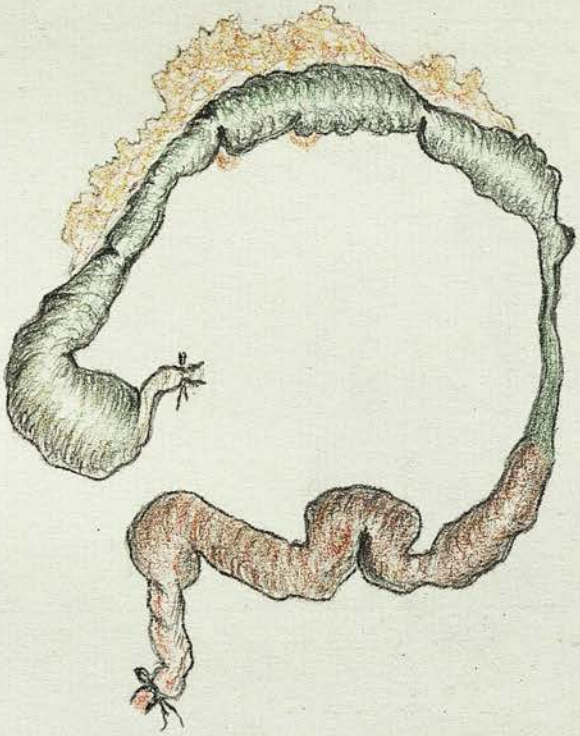


A case of acute dysentery, showing great dilatation of the caecum, transverse colon, and parts of the descending colon, following upon constrictions. The small intestine has been removed, and the liver raised up.

Plate No.V.

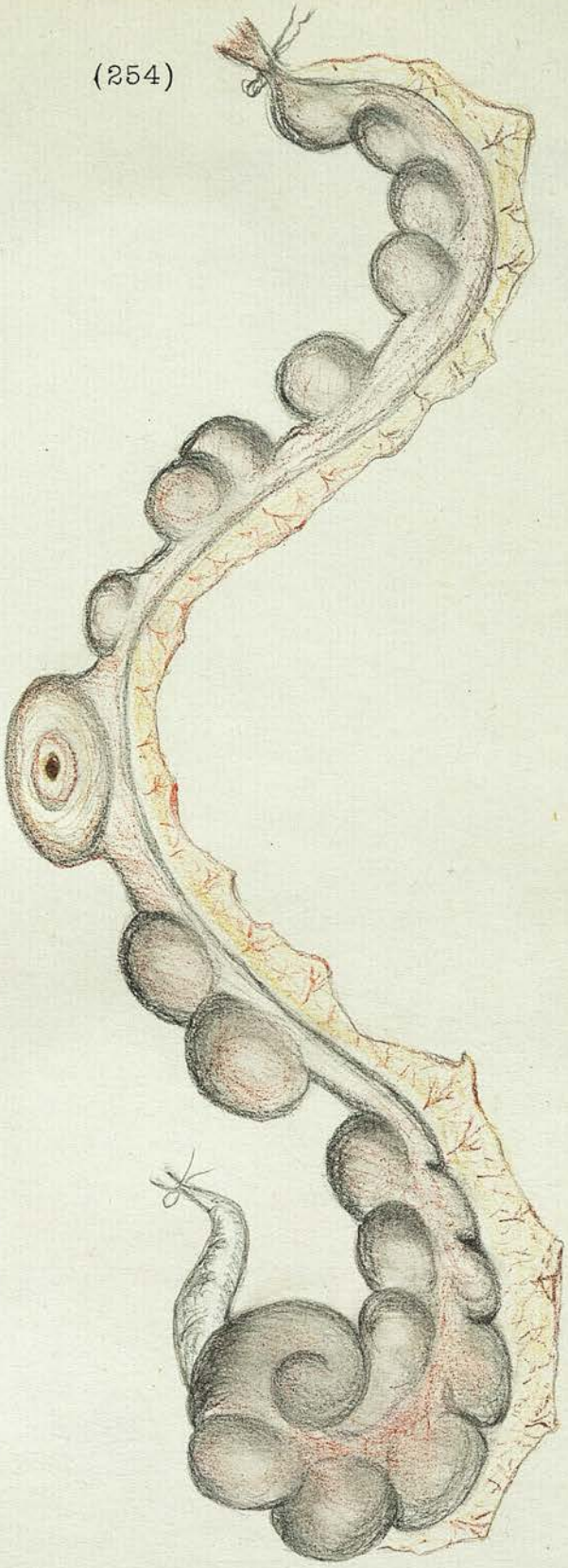


A case showing the dilatation of the transverse colon following stricture in the descending C.



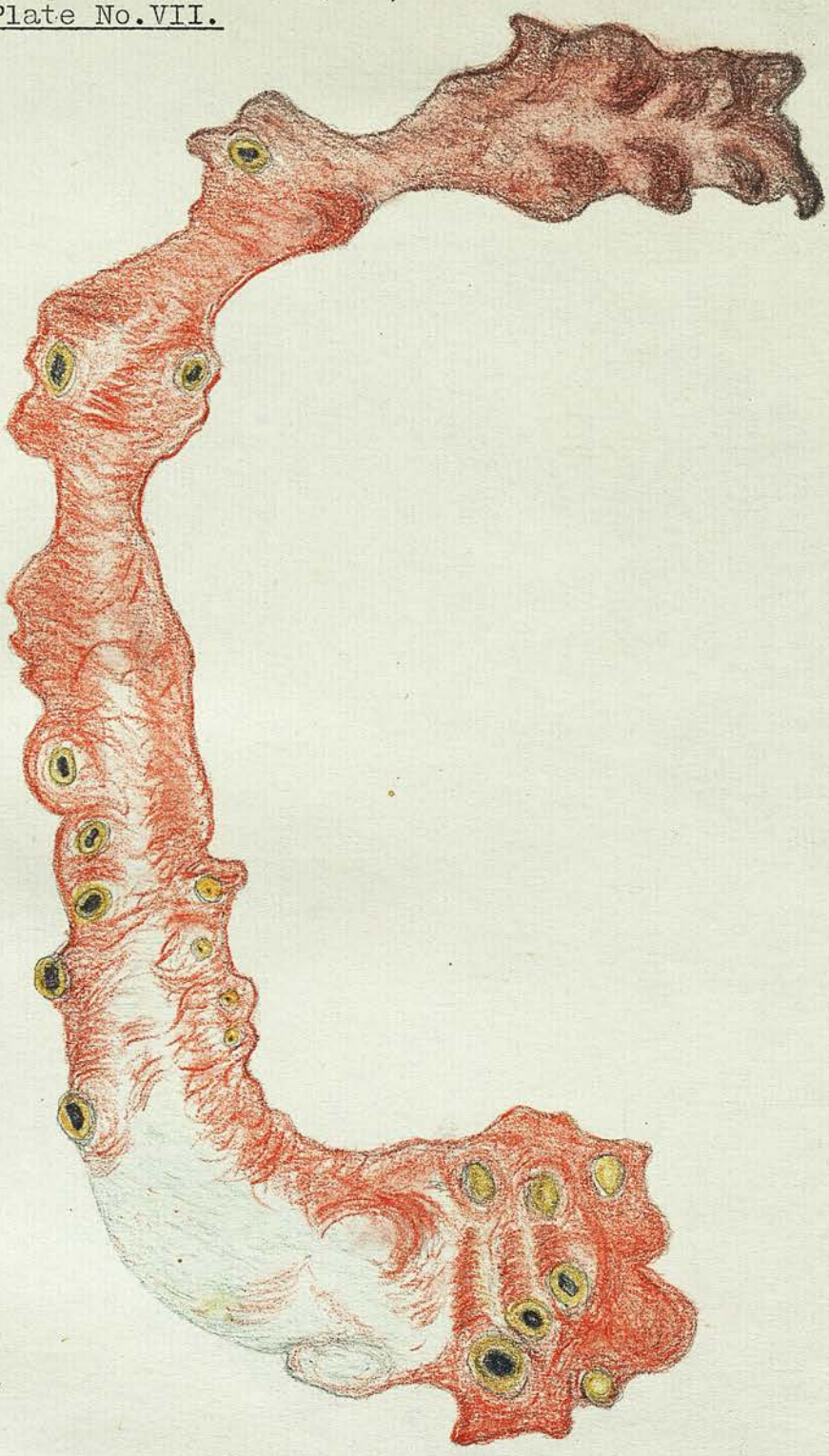
The large intestine removed from the above case to show the dilatation and stricture referred to.

Plate No.VI.



A case of acute dysentery showing contractions and dilatations along the large intestine. About the middle is an ulcer which has perforated the gut.

Plate No.VII.



A portion of large intestine laid open after acute dysentery, showing (a) constrictions and (b) ulcers which closely resemble vaccine pustules.

Plate No.VIII.

Dysentery. The caecum, ileum (near caecal end) and rectum highly inflamed. The remainder of the colon shows dark sloughs in various stages of formation.